2000 ANNUAL REPORT ON STATUS OF TRIBUTARY STRATEGIES, CHESAPEAKE BAY AGREEMENT AND WATER QUALITY FOR VIRGINIA'S CHESAPEAKE BAY AND TRIBUTARIES

2000 Report of
The Secretary of Natural Resources

November, 2000

November 8, 2000

Honorable Members of the General Assembly:

It is my pleasure to submit for your review the <u>2000 Annual Report on Status of Tributary Strategies, Chesapeake Bay Agreement and Water Quality for Virginia=s Chesapeake Bay and Tributaries</u>. This Report was produced as part of Virginia=s Chesapeake Bay Tributary Strategy Program, conducted in accordance with Article 2, Chapter 5.1 of Title 2.1 of the Code of Virginia. It also meets the requirements of Item 405 of the 2000 Appropriations Act.

Under the requirements of Item 405 of the 2000 Appropriations Act, this Report for the first time addresses the status of the Commonwealth's commitments under the Chesapeake Bay Agreement. As you may know, Governor Gilmore joined Virginia's Bay Program partners this June in signing Chesapeake 2000. The new Chesapeake Bay Agreement contains nearly one hundred commitments, ranging from land use issues to water quality restoration.

I would like to thank each of you for your leadership and commitment to improving the quality of Virginia=s water resources. We are now approaching the end of year 2000; and we anticipate that we will be close to achieving our nutrient reduction goals for the Shenandoah and Potomac River Basins. This success would not have been possible without your vision and your support of the voluntary, cooperative and locally-based tributary strategy effort.

Over the past year we have also seen the finalization of our Rappahannock River, York River and Eastern Shore tributary strategies. For the James Tributary Strategy, we have passed the major hurdle of establishing sediment and nutrient reduction goals for a very complex river system. The remaining elements of the James Strategy will be completed in 2001. A copy of each of these strategy documents is included along with this annual report.

I hope that this information answers any questions you may have regarding our Tributary Strategy Program. Please contact me if there is any other information that we may provide you.

Respectfully submitted,

John Paul Woodley, Jr.

2000 ANNUAL REPORT ON STATUS OF TRIBUTARY STRATEGIES, CHESAPEAKE BAY AGREEMENT AND WATER QUALITY FOR VIRGINIA'S CHESAPEAKE BAY AND TRIBUTARIES

2000 Report of
The Secretary of Natural Resources
to the

- House Committee on Chesapeake and its Tributaries
- Senate Committee on Agriculture, Conservation, and Natural Resources
- House Committee on Conservation and Natural Resources
- House Committee on Appropriations
- Senate Committee on Finance
- Virginia Delegation to the Chesapeake Bay Commission
- Virginia Chesapeake Bay Partnership Council

Submitted in accordance with Article 2, Chapter 5.1 of Title 2.1 of the Code of Virginia and
Item 405 of the 2000 Appropriations Act

November 2000

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The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

Virginia Coastal Program

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Table of Contents

Table of Contents, continued

Table of Contents, continued

List of Figures

List of Tables

STATUTORY BASIS AND FORMAT OF REPORT

This report is in response to two legislative requirements:

(1) Article 2 of Chapter 5.1 of Title 2.1 of the Code of Virginia (Appendix A) calls for an annual report of progress being made in the development and implementation of nutrient reduction strategies for Virginia=s tributaries to the Chesapeake Bay. This is the fifth annual report prepared in response to this Code requirement.

(2) Item 405 of the 2000 Appropriations Act (Appendix A) directs the Secretary of Natural Resources to report annually on the progress made by the Commonwealth in achieving a 40 percent reduction of nutrients into Chesapeake Bay and to provide information on the status of all Virginia's commitments under the Chesapeake Bay Agreement.

Part One of this Report describes the development and implementation of nutrient reduction strategies for Virginia=s Chesapeake Bay tributaries. Part Two addresses Virginia's progress under the Chesapeake Bay Agreement. Part Three describes the key environmental status and trends information for Virginia's Chesapeake Bay and tidal tributaries.

PART ONE
DEVELOPMENT AND IMPLEMENTATION OF VIRGINIA=S TRIBUTARY STRATEGIES

INTRODUCTION TO PART ONE

Part One of this report describes the current progress being made in the development and implementation of Virginia=s tributary strategies, the near term outlook for those strategies, and the context for how these strategies will evolve over the next ten years.

- Section I provides an overview of Virginia's Tributary Strategy initiatives.

- Section II outlines key strategy-related legislative and administrative actions including implementation of the Virginia Water Quality Improvement Act of 1997.

- Section III describes the effort being undertaken by Virginia and her Chesapeake Bay Program partners to address water quality problems in the Bay through the non-regulatory approach of Tributary Strategies.

- Sections IV- VIII describe the status of Tributary Strategies for the Shenandoah and Potomac River Basins; the Rappahannock River and Northern Neck Coastal Basins; the York River Basin; the James River Basin; and the small coastal basins of Virginia's Eastern Shore. Section IV on the Shenandoah and Potomac River Basins includes a discussion of current efforts to develop an Interim Nutrient Cap Strategy.

I. OVERVIEW OF VIRGINIA'S TRIBUTARY STRATEGIES

A. Background and Purpose of Virginia's Tributary Strategy Initiative

Nutrient reduction strategies serve as Virginia's main program for reducing nutrient and sediment loads to tributary rivers of the Chesapeake Bay. Current levels of erosion, sediments and nutrients throughout the Bay watershed have led to water quality problems that affect smaller creeks, major rivers and the main stem of the Bay. These water quality problems include low levels of dissolved oxygen, high sediment loads, diminished beds of submerged aquatic vegetation and others. In Virginia, these problems have led to severe impacts on aquatic habitat, fisheries and other living resources. It was for this reason that Virginia undertook its commitment under the Chesapeake Bay Agreement to develop nutrient reduction strategies, and strategies now have been developed for each of Virginia's major Bay tributaries (goal-setting for the James River Basin Strategy is complete; the implementation plan is now being developed).

Virginia's Tributary Strategy Program is a multi-agency, cooperative effort to restore water quality and living resources in Chesapeake Bay tributaries. The Program is operated under the statutory guidance of Virginia's 1996 Tributary Strategy Law and the 1997 Water Quality Improvement Act. The Tributary Strategy Law was amended in 1999 to require that all strategies address sediment, as well as nutrient, reductions in order to protect water quality.

B. Program Approach and Philosophy

Virginia=s tributary strategy program is a voluntary and cooperative program based on scientific data and analysis and local determination. Farmers, local officials, businesses, citizen groups and other stakeholders are provided scientific information on nutrient and sediment loads in their watershed and water quality conditions in their rivers, creeks and streams. They then participate in developing strategies based on this information and their own experience. This process includes establishing goals for nutrient and sediment reductions, identifying cost-effective practices for achieving these reductions, and implementing these practices.

This approach allows each tributary strategy plan to reflect specific water quality issues and the unique needs and circumstances of each tributary basin and the people who live and work there. Each basin has distinct characteristics, and each requires an individualized approach.

C. Overview of the Shenandoah and Potomac River Basin Strategy

The Potomac Strategy was developed over a four-year period in an effort to meet Virginia's Bay Program commitment to a 40% reduction in controllable nutrients relative to the baseline year of 1985. The 40% nutrient reduction goal was established for most tributaries to the Chesapeake Bay using the advanced Chesapeake Bay Water Quality computer model. This model predicted the benefits, particularly improved levels of dissolved oxygen, that would result from a 40% load reduction.

The Strategy was developed in partnership with local officials, farmers, wastewater treatment plant owners, conservation groups and others and was completed in December 1996. Under cost-share funding from the Water Quality Improvement Fund, significant reductions, and progress toward the 40% goal, have been achieved by farmers, local governments and point sources in the basin. It is anticipated that these reductions will be close to achieving the 40% goal at the end of 2000 (certain projects will not be completed, but will be under construction).

To maintain the water quality benefits and living resource improvements achieved through the Shenandoah and Potomac Strategy, an important requirement is that the reduced loading levels of nutrients must be maintained, once they are achieved. For the Shenandoah and Potomac River basins, an "Interim Nutrient Cap Strategy" is currently being developed that will address ways to offset any increases in nutrient loads and maintain our target loading levels. The Strategy will also be amended to address sediment loads, as soon as scientific information becomes available on appropriate sediment reduction goals. These additions will require continued state investments to water quality through the Water Quality Improvement Fund.

D. Overview of Virginia's Lower Bay Tributary Strategies

The Chesapeake Bay Water Quality computer model demonstrated that the nutrient loads from Virginia's Lower Bay tributaries, including the Rappahannock, York and James Rivers and the small coastal basins of the eastern and western shores, do not have a significant effect on the water quality problems of the mainstem Bay. Therefore, Water Quality model runs and nutrient and sediment reduction goals have been targeted directly at these tributary systems on an individual basis. Tributary strategies were then developed in an effort to specifically improve the water quality of those rivers themselves and to restore their living resources.

The development of these tributary strategies was accomplished using the same voluntary, cooperative approach that was applied to the Potomac Strategy. Each of these strategies has been finalized or is in near-final form. Virginia's Secretary of Natural Resources announced their final release in August of 2000. A brief discussion of these strategies is offered below, with more detailed information provided in Sections IV – VIII.

1. Rappahannock River Tributary Strategy:

The Rappahannock River suffers the worst water quality problems to be found in Virginia waters as a result of nutrient over-enrichment. Approximately three-quarters of all of Virginia waters that have no oxygen in them during the summer months are found in the Rappahannock River. Because of these problems, stakeholders in the Rappahannock basin established robust nutrient and sediment reduction goals and developed an implementation plan. This effort was aided by the involvement of the legislatively-formed Rappahannock River Basin Commission and the Rappahannock Conservation Council (funded through a portion of the $280,000 tributary strategy money allocated to soil and water conservation districts). The work of these citizens and elected officials was augmented by the expertise of a Rappahannock Technical Review Committee, which provided recommendations on goal-setting and implementation.

The Rappahannock Strategy went through four drafts, in order to maximize public input, and now has been finalized. It describes the practices and programs enhancements necessary to achieve the nutrient and sediment reduction goals for the Rappahannock basin. It also details the costs associated with these practices. The Strategy also sets forth reevaluations that will be conducted in the coming years to ensure success by the goal-deadline year of 2010.

2. York River Tributary Strategy:

The York River also suffers water quality problems related to nutrient over-enrichment. The Strategy goals for the York River basin were developed through substantial involvement by the agricultural community and soil and water conservation districts in the basin. This includes specific projections and implementation rates for agricultural BMPs and other means of dealing with the predominant nonpoint source nutrient loads in the basin. Like the Rappahannock Strategy, the York Strategy includes sediment reduction goals, which are essential for achieving water quality improvements, and cost projections associated with achieving identified goals.

The York Strategy also includes a framework for point source reductions that will achieve benefits to the York River. However, further cooperative efforts will be undertaken to ensure that point source owners support these actions and will undertake nutrient reduction projects in the early years of Strategy implementation.

3. James River Tributary Strategy:

The James River does not currently suffer from major water quality problems associated with nutrient over-enrichment; and stakeholders in the James River basin have participated in numerous meetings to determine appropriate reduction goals to improve water quality. Current scientific knowledge indicates that the high level of suspended sediment in the James River has the effect of ameliorating the water quality problems associated with nutrient over-enrichment. It is estimated that the best course of action in the James River basin is to achieve nutrient reductions concurrently with sediment reductions to ensure that water quality problems such as algae blooms or lack of dissolved oxygen do not arise as sediment levels are reduced.

In August 2000 the Secretary of Natural Resources approved the document entitled “Tributary Strategy Goals for Nutrient and Sediment Reduction in the James River.” This document presents a proposal for challenging yet practical implementation goals that will achieve nutrient and sediment reductions. These goals will be assessed along the way in order to ensure that funds and practices are being effectively targeted. Current efforts are focused on drafting a tributary strategy implementation plan to achieve these goals.

4. Eastern Shore Tributary Strategy:

Water quality problems exist in a number of the smaller creeks and streams of Virginia's Eastern Shore. However, water quality monitoring and modeling data are not yet detailed enough to be able to predict water quality improvements that would result from various levels of nutrient and sediment reductions. Therefore, the Eastern Shore Strategy sets forth an implementation plan, agreed upon by stakeholders that will achieve nutrient and sediment reductions and provide for an assessment of resulting water quality benefits. Parallel to implementation, efforts will be undertaken to improve our environmental understanding of the value of these systems in order to refine and target further programs and practices.

The Eastern Shore Strategy includes descriptions of practices and associated costs. Implementation and effectiveness of the Strategy will be assessed before final targets for water quality improvement are established.

E. Future Tasks and Resource Needs

With completion of strategies for all of Virginia's Chesapeake Bay tributary basins, all of the approximately 22,000 square miles of the Commonwealth's Bay watershed will be geared up for implementation of point and nonpoint source nutrient reduction activities that will restore tributary water quality. Natural Resource Agencies will continue to work with local officials, citizens and stakeholder groups to ensure that implementation actions are effectively targeted and continue to focus on the most cost-effective, practical and equitable programs and activities.

Watershed Conservation Roundtables are being organized by the Department of Conservation & Recreation in each of Virginia's major watersheds in cooperation with Soil & Water Conservation Districts (SWCD), other state agencies, local governments, industries, citizens, and existing watershed organizations. The Roundtables will provide a watershed-based forum for stakeholders to participate in: defining critical watershed needs; targeting problems for solutions; providing input into potential management options, and developing action plans which will serve as a road map for reducing nonpoint source pollution in the Commonwealth, focussing on cooperative, voluntary efforts.

The Department of Environmental Quality is working to coordinate tributary strategy efforts with ongoing water quality management planning within these river basins. As will be detailed in Section III, both agencies are working to continue the cooperative nature of the tributary strategy programs in the face of possible federal regulatory controls.

Implementing all of Virginia's strategies at the levels to achieve water quality goals agreed upon in each tributary basin will require substantial resources and investments on the part of local governments, state government, farmers, industries and citizens across Virginia's Bay watershed. Our experience in the Shenandoah and Potomac River Basins demonstrates that Virginians are willing to step forward and protect water quality if the costs for these actions are shared among private and public sectors. This cooperative approach will have to continue in order to achieve, and ultimately maintain, current reduction goals, and any additional goals that are identified through further modeling or targeting.

II. LEGISLATIVE AND ADMINISTRATIVE ACTIONS

A. General Assembly Actions

The two major statutes that govern, guide, and provide a financing mechanism for the Commonwealth's partnership role in the tributary strategy initiative were not amended by the 2000 General Assembly. These statutes appear in the Virginia Code as the Tributary Strategy Law (Article 2 of Chapter 5.1), enacted in 1996, and the Water Quality Improvement Act (Articles 1-4 of Chapter 21.1), passed by the 1997 General Assembly.

The Tributary Strategy Law specifies the content and schedule for plans to restore water quality and living resources of Chesapeake Bay and its tributaries, primarily through nutrient and sediment reductions. The Water Quality Improvement Act established cooperative point and nonpoint source pollution control programs, and created the Water Quality Improvement Fund (WQIF). The WQIF is the primary source of State funds to cost-share nutrient and sediment reduction actions identified in tributary strategies. The WQIF has proven to be a key incentive for implementing the strategies, and the significant progress made in reducing nutrient and sediment loads from point and nonpoint sources is largely the result of WQIF grants.

The 2000 General Assembly approved a $28.85 million deposit into the WQIF, which included new funding, interest earned on the WQIF, and reprogrammed funds that had been earmarked for certain projects in earlier appropriations. The adopted State biennial budget also provided $13.8 million to support ongoing tributary strategy operations of the Departments of Conservation and Recreation and Environmental Quality. Final budget figures are shown in Tables 1 and 2.

Table 1. Legislative Plan Adopted for Water Quality Improvement Fund (millions of dollars)

	FY 2001	FY 2002**
DEQ – Point Source Program:		
Construction Grants to Localities*	$16.85	$0.0
DCR – Nonpoint Source Program:		
Grants to Localities, landowners and Others	$7.4	$0.0
Conservation Reserve Enhancement Program	$4.6	$0.0
TOTAL WQIF SPENDING	**$28.85**	**$0.0**

*Note: consists of $10.3 million in new funds, $2.7 million in interest, and $3.85 million in existing funds that had been reserved for Blue Plains and "Challenge Grants."
**Note: The entire appropriation for the biennium was deposited in the WQIF in the first year.

Table 2. General Fund Appropriations to Support Tributary Strategy Initiatives (millions of dollars)

	FY 2001	FY 2002
DEQ Programs:		
Total Maximum Daily Loads	$0.3	$0.0
Poultry Litter Control	$0.6	$0.6
James River Combined Sewer Controls	$7.6	$0.0
Fish Tissue Analyses	$0.3	$0.3
Bay Tributary Strategies	$0.3	$0.4
DEQ Total	**$9.1**	**$1.3**
DCR Programs:		
Total Maximum Daily Loads	$0.6	$0.6
Manage Water Quality Improvement Act	$0.5	$0.5
Conservation reserve Program	$0.1	$0.1
Poultry Litter Control	$0.4	$0.4
BMPs Engineering Services	$0.2	$0.0
DCR Total	**$1.8**	**$1.6**
TOTAL FOR TRIBUTARY STRATEGY SUPPORT	**$10.9**	**$2.9**

The 2000 General Assembly also included language in the Appropriations Act (Item 405 #1c) directing the Secretary of Natural Resources to provide information on the status of all Virginia's commitments to the Chesapeake Bay Agreements. This amendment complements existing language requiring a report on progress made in reducing nutrients in the Chesapeake Bay and its tributaries by including a status report on all state commitments made under the several Bay Agreements. Part Two of this Annual Report outlines the status of the commitments in the new *Chesapeake 2000 Agreement*, signed by the Bay Program's Executive Council this past June.

B. Administration Actions

Under the Water Quality Improvement Act, the Secretary of Natural Resources is charged to develop written guidelines for distribution of grants from the WQIF and criteria for prioritizing funding requests. Since the 2000 General Assembly did not amend either the Tributary Strategy Law or the Water Quality Improvement Act, the WQIF Grant Guidelines issued in November 1999 remain unchanged and in effect for the coming fiscal year. Should the 2001 General Assembly amend either of these statutes, or pass budget language giving specific directions for the use of WQIF grants, then the Guidelines will be reviewed to ensure consistency, and revised if necessary.

In response to the *Nonpoint Source Pollution Management Program FY2000 Request for Proposals,* DCR received 95 grant applications by the December 15, 1999 deadline. The grant amounts made available were $1 million for the Southern Rivers (those watersheds not draining to the Chesapeake Bay), $200,000 for the Potomac/Shenandoah, and $1,250,000 for the Lower Bay Tributaries. Projects were reviewed for eligibility and prioritized by the Nonpoint Source Advisory Committee, composed of representatives from ten State and Federal agencies. Grant awards were made to 34 nonpoint source pollution control projects, as shown in Table 4 on pages 13 and 14.

DEQ received 19 WQIF applications by the December 27, 1999 deadline, seeking a total of $95.97 million in grant funds. The WQIF point source program had $25.15 million available for FY00 projects, and budget language specified that they must be located in the lower Bay tributaries (Rappahannock, York, James, or small coastal basins). At the time FY00 applications were received, it appeared that the amount of funds in the WQIF wouldn't cover the existing grant awards ($61.47 million committed under signed agreements; only $47.1 million appropriated for projects in the Shenandoah/Potomac). Therefore, the DEQ Director postponed a final decision on the award of FY 2000 grant funds until the WQIF appropriation for the next biennium was finalized. This is in keeping with a provision of the Water Quality Improvement Act requiring that the Director manage the allocation of grants from the WQIF to ensure full funding of executed grant agreements.

The FY01-02 biennium WQIF appropriation was finalized after the General Assembly's April 4, 2000 veto session, with $13 million in new funds and $3.85 million in reprogrammed funds made available for point source projects. It has been decided to hold these new funds to cover existing grant agreements. Therefore, a Request for Proposals for WQIF point source projects will not be issued this year.

Contract negotiations are continuing with the FY 2000 grant applicants, for priority projects identified in the lower Bay tributary strategies, as described in the table that follows:

Table 3. Priority Projects: FY 2000 WQIF Point Source Program

APPLICANT	GRANT REQUEST	NOTES
Rappahannock Basin:		
Faquier-Remington	$2,640,000	75% Construction Grant; challenge grant for enhanced BNR (meet 5.5 mg/l TN)
Spotsylvania-Massaponax	$4,290,000	50% Construction Grant; BNR retrofit as part of plant expansion (6 to 8 MGD)
Spotsylvania-FMC	$2,450,000	50% reimbursement Construction Grant for work in-place + install BNR in plant expansion (4 to 5.4 MGD)
Stafford-L. Falls Run STP	$1,846,541	50% reimbursement Construction Grant for work in-place + new denit recirc pump
York Basin:		
Hanover-Totopotomoy	$1,592,175	50% Construction Grant; BNR installation in new 5 MGD plant
James Basin:		
Chesterfield-Proctors Crk	$1,032,840	50% reimbursement Construction Grant for work in-place
Henrico STP	$9,058,754	50% reimbursement Construction Grant for work in-place + install BNR in plant expansion (45 to 75 MGD)
Hopewell Regional WTF	$2,643,503	55% Construction Grant; Phase 1A of 3-phase nitrogen reduction project; reduce influent nitrate in anoxic primary tank
Richmond STP	$3,749,917	50% reimbursement Construction Grant for work in-place
TOTAL =	$29,303,730	

The figures shown above are the requested amounts, and will likely change based on the final eligibility determinations made for each project's scope of work. The total amount requested exceeds the FY00 appropriation by about $4.2 million. The projects that involve new construction will be built in phases over several years, so grant reimbursements will also be made in installments as work is completed. This will allow for the projects to proceed over time, with the expectation that continued appropriations will be added to the WQIF to achieve full funding of the agreements. It will be proposed that payments be spread over several years on the projects seeking reimbursement for work-in-place, rather than making lump sum payments. Grant agreements will be written to include the total amount of eligible work, but the contract provisions will continue to clearly state that full funding of the grant is subject to the availability of funds as appropriated by the General Assembly.

Table 4. WQIF Nonpoint Source Projects Approved for Funding FY2000

Southern Rivers ($1,000,000 available)		
Project Title	**Sponsor**	**Suggested Funding**
Big Walker SWCD No-Till Drill	Big Walker SWCD	11,157
Birch Creek Watershed Septic Tank Maintenance	Halifax SWCD	30,300
Blackwater TMDL Implementation Planned Development & Execution	Ferrum College	138,250
Franklin County Septic System Repair	Franklin County	42,000
Guest River Restoration	Lonesome Pine SWCD	90,000
Hardscrabble Engineering Academy	Clinch Valley SWCD	42,600
Joint Septic Tank Pump-Out Maintenance & Evaluation Program	Bedford County	46,500
South Roanoke County Regional Stormwater Management Facility	County of Roanoke	230,000
Southwest Streams Partnership	Western Virginia Land Trust	100,000
Upper Bluestone River Watershed Protection District-Phases 1-3	Town of Bluefield	30,000
Upper Levisa River Restoration	Lonesome Pine	72,700
Upper Powell River Restoration Project	Hands Across the Mountain, Inc.	82,243
Wallen Creek Conservation & Education Program	Daniel Boone SWCD	84,250

Shenandoah-Potomac ($272,000 available)		
Project Title	**Sponsor**	**Suggested Funding**
Augusta Cooperative Farm Bureau, Inc. NMP Initiative	Augusta Coop Farm Bureau	36,000
Houff's Feed Fertilizer -Continued NM Initiative	Houff's Feed Fertilizer	36,000
Nonpoint Source Pollution Control from Existing Urban Development	Prince William County Public Works	72,000
TMDL Implementation for Muddy Creek, Lower Dry River, Mill Creek & Pleasant Run Watershed	Rockingham County Farm Bureau	128,000

Lower Bay Tributaries ($1,250,000 available)		
Project Title	**Sponsor**	**Suggested Funding**
City of Lynchburg Stormwater Retrofits, Streambank Stabilization & Riparian Restoration	City of Lynchburg/Robert E. Lee SWCD	75,000
County of Henrico Proposed Watershed Management Program	County of Henrico	76,626
Establishment & Preservation of a Forested Buffer Along Reedy Creek with the Installation of Selective Streambank Stabilization & Enhancement	City of Richmond Dept. of Public Works	55,000
Friends of Chesterfield's Riverfront James River Land Conservation Project	Friends of Chesterfield's Riverfront	40,434
Greenwood Drive - Regional Retention Stormwater Basin	City of Portsmouth Dept. of Engineering & Tech Services	88,000
Hanover County Stormwater Management Program	Hanover County SWM	100,000
Riparian Lands Restoration/Protection	James River Association	35,400
Innovative Nursery BMPs	Tidewater RC&D	95,750
Lambert's Point Stormwater Quality Pond	City of Norfolk	250,000
Louisa County Stormwater Management	Louisa County	17,904
Lower Tributaries Soil & Water Conservation Plan Writing for the Reduction of Excess Nutrient Runoff	Eastern Shore SWCD	67,600
Nutrient Management Plan Project in the York River Watershed	Agricultural Systems	47,353
Onsite Wastewater Improvements Project	MP Planning District Commission	57,483
Southgate Plaza Constructed Wetland Stormwater Retrofit	The Elizabeth River Project	75,000
Thalia Creek Wetlands Re-establishment	City of Virginia Beach	100,000
Tylers Beach Boat Harbor Shoreline Stabilization	Isle of Wight County	51,000
Urban Conservation Planning (Residential Nutrient Management)	Tidewater SWCD	17,450

III. CHESAPEAKE BAY INTEGRATION PROCESS

The successes of tributary strategies and other elements of Virginia's Chesapeake Bay Program are widely attributed to the cooperative, partnership approach used in plan development and implementation. The majority of citizens who have participated in Virginia's tributary strategies have opposed a regulatory approach for addressing nutrient and sediment problems.

Beginning in 1998, the U.S. Environmental Protection Agency proposed implementation of a Total Maximum Daily Load (TMDL) regulatory program under Section 303(d) of the Clean Water Act to address nutrient-related problems in much of Virginia=s Chesapeake Bay and tidal tributaries. In May 1999, EPA included Virginia=s portion of the Bay and several tidal tributaries on the 1998 federal Section 303(d) TMDL list of impaired waters for Virginia based on failure to meet standards for dissolved oxygen and aquatic life use attainment.

This regulatory action could create difficulties for Virginia's tributary strategies because it would effectively supplant the nutrient-reduction goals, programs and methods agreed upon by citizens, businesses and local officials across Virginia's Bay watershed. In addition, it could lead to overlap of government programs and confusion among citizens.

In an effort to coordinate Virginia's tributary strategies with EPA's regulatory approach, and avoid these problems, staff with the Department of Environmental Quality proposed a "Process for Integrating the Cooperative and Regulatory Programs of the Chesapeake Bay and its Tributaries." The goal of this process is to keep the nutrient reduction tributary strategies outside of the regulatory arena for a specific period (ten years), and to effectively implement those strategies during that period to remove the Bay and tidal tributaries from the TMDL list prior to regulatory action. Since development of that process, the signatories to the Chesapeake Bay Agreement, including EPA, have agreed upon this approach and over the next ten years will be working to "delist" the Bay and its tidal tributaries. This effort has also involved the non-signatory states in the Bay watershed, including Delaware, New York and West Virginia.

In order to delist the Bay and its tidal rivers, the appropriate state water quality standards for these waters must be attained. Pursuant to commitments established in settlement of the litigation regarding Virginia's TMDL program, representatives of EPA-Region III stated at a June 29, 1999 meeting that a regulatory TMDL must be adopted for Virginia=s portion of the Bay by May 2011 unless the Bay is delisted prior to that date. To successfully delist the Bay, a three step process was proposed and agreed upon:

1. Identify the water quality conditions, or environmental endpoints, that achieve the desired level of protection for living resources and human health in the Bay and its tidal tributaries;
2. Make appropriate revisions to the state water quality standards to include the environmental endpoints for the Chesapeake Bay and its tidal rivers; and,

3. Reduce the input of nutrients and sediments throughout the Bay watershed to jointly achieve the state water quality standards and other Chesapeake Bay Program goals.

To achieve these required elements, a Water Quality Technical Workgroup of the Chesapeake Bay Implementation Committee was established; and a schedule was developed and agreed upon. That schedule will guide a significant portion of Chesapeake Bay Program and Virginia tributary strategy activities over the next ten years. It includes the following:

(Both) 1. Begin process of selecting living resource endpoints to define nutrient impairments in th the EPA Nutrient Criteria Process for the Bay –1999.

(CBP) 2. Virginia adopt nutrient and sediment goals and strategies for the Rappahannock, York and James Rivers and Eastern Shore -1999.

(TMDL) 3. Begin development of local and small tributary nutrient TMDL's - 1999

(CBP) 4. States develop, and begin implementation of, interim cap strategies to maintain 40% reduction goal - 1/1/2001.

(Both) 5. Reach agreement on environmental endpoints and criteria and their applicability to regions of the Bay and tidal tributaries. Secure EPA concurrence that achieving the selected endpoints, if adopted as the applicable state standards, would result in delisting the Bay and its tidal tributaries. (NOTE: any delay in completing this step will result in corresponding delays in steps 6, 7, 8 and 9) - 2001.

(CBP) 6. Establish nutrient and sediment loading reductions to achieve endpoints and allocate loading reductions to tributaries, taking into account endpoint analysis and Priority Living Resource areas - 2001.

(TMDL) 7. Initiate regulatory process to revise state water quality standards for dissolved oxygen and other parameters as appropriate and necessary to conform with the environmental endpoints -2001.

(CBP) 8. Revise CBP tributary strategies to reflect new allocations and incorporate final cap strategy - 2002.

(TMDL) 9. Using their best efforts, states will adopt revised water quality standards for the Chesapeake Bay and tidal rivers based on this process - 2003.

(Both) 10. Complete a comprehensive evaluation to determine if any refinements are needed in nutrient and sediment loading reduction goals and strategies to ensure the Bay and its tidal rivers can be delisted by 2010. The evaluation will include: environmental endpoints, nutrient criteria, state standards, results from upgraded Bay model, and impact of local and small tributary TMDLs on the Bay and tidal rivers - 2005.

(CBP) 11. Using cooperative efforts through the CBP, achieve necessary load reductions to achieve water quality standards - 2010.

(TMDL) 12. If successful, delist the Bay and tidal tributaries - 2010; OR if unsuccessful, complete analysis of where additional reductions are needed and establish a TMDL to achieve water quality standards - 2011.

CBP refers to a voluntary program that applies only to the Signatory States of the Chesapeake Bay Agreement; TMDL refers to the regulatory process in Section 303(d) of the Clean Water Act and applies basinwide to all states within the Chesapeake Bay watershed; Both refers to both.

The process for delisting the Bay may lead to revisions of the nutrient reduction goals for any or all of Virginia's tributary basins. It is likely that any revised reduction goals will be more ambitious than the goals currently set forth within the respective tributary strategies. Additionally, this process will lead to the establishment of a sediment reduction goal for the Shenandoah and Potomac River basins, and may lead to revised sediment reduction goals for the lower tributaries. These new goals will be developed based on model runs of the Chesapeake Bay Water Quality computer model, which will be used to determine the reduction levels necessary to achieve the desired water quality conditions and environmental endpoints.

Concurrent with this process, scientists in the Chesapeake Bay Program continue to improve the capabilities and accuracy of the Chesapeake Bay Water Quality model. Updated versions of this model become available periodically, and those updates can lead to changes in tributary reduction scenarios.

These policy developments and improvements in technical information are integral parts of the delisting process and are important for ensuring that identified nutrient controls and reduction levels are beneficial and necessary. However, the backbone of the delisting process will continue to be effective and full implementation of the point source and nonpoint source elements of Virginia's tributary strategies. Over the next ten years, Virginia's success at avoiding imposition of a regulatory TMDL Program for the Chesapeake Bay and tributaries will hinge upon a continued commitment to implementing a full range of nutrient and sediment reduction practices that address all source categories.

IV. THE SHENANDOAH-POTOMAC TRIBUTARY STRATEGY

A. Tributary Strategy Goals

The goal of the Shenandoah-Potomac Tributary Strategy is to achieve a 40% reduction (relative to 1985 loads) in controllable phosphorus and nitrogen loads to the Potomac River by end of the year 2000. This goal was shared among the Potomac River basin and all tributary basins to the north of the Potomac in Maryland, Pennsylvania and the District of Columbia. This goal was established using scientific data from the Chesapeake Bay Water Quality model, which predicted that dissolved oxygen levels in the main stem of the Bay would improve by approximately 25% and that water quality within individual tributaries would also improve.

B. Tributary Strategy Implementation

The Shenandoah – Potomac Strategy was completed in 1996, establishing a plan for achieving 40% nutrient reduction goal that targeted the most cost-effective nutrient controls and shared responsibility among diverse nutrient sources. Since the development of the Strategy, and the passage of the Water Quality Improvement Act (WQIA) in 1997, great progress has been made toward achieving this goal. Many interested citizens played important roles in developing the Strategy, as did representatives of farming and agribusiness, soil and water conservation districts, local governments, wastewater treatment plants, conservation groups and others. Many more have participated in its implementation.

1. Nonpoint Source Implementation

Virginia is on target to meet the nonpoint source portion of the tributary strategy commitment. Those objectives called for reducing nitrogen by 3,454,512 pounds and phosphorus by 561,441 pounds. As of September 30, 2000, Virginia has reduced nitrogen by 3,195,759 pounds and phosphorus by 528,295 pounds. Based on implementation rate trends and commitments already made, such as landowners that have agreed to install reduction measures, nitrogen reductions of 3.6 million pounds and 619,000 pounds of phosphorus will be achieved by December 31, 2000.

The principal non point source components of the Strategy included agricultural Best Management Practices and agricultural nutrient management planning. The agricultural BMP's were implemented through Virginia's Agricultural Best Management Practices Cost Share Program, which is administered locally by Soil and Water Conservation Districts. Each of the ten soil and water conservation districts in the watershed were assigned nutrient reduction goals based on a level of BMP installation. All ten districts have met or exceeded their goal. These districts were able to address the land owner BMP needs through the continued employment of technical staff aided by $500,000 in annual support funds from the DCR. A total of $12.55 million was distributed through Agricultural Best Management Practices Cost Share Program for agricultural BMP installation.

Nutrient Management Planning has been accomplished through a combined effort of Department of Conservation and Recreation nutrient management staff, local soil and water conservation district staff and private certified nutrient management planners. Additionally, in the Shenandoah Watershed, two local agri-business firms have contracted through a Water Quality Improvement Act grant to carry out nutrient management planning. The Strategy has led to nutrient management plans being implemented on farms that traditionally have not participated in any state or federal conservation programs. Additional demands for nutrient management plans have resulted with the passage of HB 1207, which requires nutrient management plans for poultry producers. Approximately 280,000 acres have had nutrient management plans completed in the Shenandoah Potomac Watershed.

As part of the future efforts to reduce nutrient loads in the Shenandoah and Potomac River basins, the Department of Conservation and Recreation has formed "roundtables" in each of the major river basins. These roundtables are intended to maintain a long-term level of stakeholder involvement in the Commonwealth's tributary strategy initiatives.

Shenandoah Watershed Roundtable - Shenandoah Valley Pure Water 2000 Forum serves as the watershed roundtable for the Shenandoah watershed. The membership of this organization reflects the interests of business, local government, state and Federal agencies, agriculture and environmental groups. The Pure Water 2000 Forum hosted and facilitated three local focus group meetings for the Interim Cap Strategy process. Additionally the Pure Water 2000 Forum has partnered with DCR on several educational initiatives.

Potomac Watershed Roundtable - The Potomac Watershed Roundtable was launched at the first ever Potomac Watershed Forum held on August 25, 2000. Nearly 300 local government officials, planners, conservation leaders and concerned citizens met at George Mason University to discuss issues of watershed conservation and water quality. The forum was sponsored by the Potomac Council (made up of the six Soil and Water Conservation Districts in Virginia's portion of the Potomac Watershed, and the Virginia Department of Conservation and Recreation Potomac Watershed Manager) and the Department of Environmental Quality.

The roundtable seeks to broaden participation to include every major sector in the Potomac River Basin, and to raise the overall level of participation. Elected officials, chief administrative and/or chief environmental officers of local governments, board members of Soil and Water Conservation Districts, managers of industrial and municipal point sources, regional environmental managers of state agencies, cooperative extension agents, and leaders of community watershed organizations are being invited. The Council is also making efforts to secure business, industry, forest product, and agribusiness participation.

The roundtable will discuss ongoing and emerging issues. Early discussions will focus on the current efforts to develop a plan to maintain or "cap" nutrient reductions achieved through the 1996

Shenandoah and Potomac Nutrient Reduction Strategy. Discussions will also focus on how implementation of this interim "Cap Strategy" fits in with the ongoing efforts to remove the tidal portions of the Potomac and the Chesapeake Bay from the federal "impaired waters list."

2. Point Source Implementation

Point Source nutrient reductions in the Shenandoah and Potomac River basins through the year 1999 are detailed in the first table of Appendix B. Progress continues to be made on point source nutrient reduction projects under seventeen signed WQIF grant agreements. These projects account for about $61.47 million in state cost-share, with just over $27 million reimbursed to–date for work accomplished. Once operational, these projects will remove an estimated 7.2 million pounds of nitrogen and 216,000 pounds of phosphorus per year. Details on these projects are shown in the following table.

Table 5. Status of Point Source WQIF Projects in the Shenandoah/Potomac

Facility	Grant Amount	Size (MGD)	Status
Stafford Co.-Aquia	$351,962	6.0	**BNR on-line** ('99 TN=5.56 mg/l)
Fred/Win SA-Opequon	$2,828,963	8.4	**Construction complete**
Harr/Rock RSA-N. River	$2,871,547	16.0	**Construction complete**
SIL Clean Water	$546,000	N/A	**Design completed**
SIL Clean Water	$1,983,890	1.92	**Construction complete**
Fairfax-Blue Plains	$1,387,500	31.0	28% paid; **BNR retrofit complete**
Loudoun Co. SA-Bl. Plains	$365,500	13.8	45% paid; **BNR retrofit complete**
Leesburg	$6,477,734	4.85	BNR about 48% complete
Stuanton-Middle River	$1,299,433	6.8	BNR about 40% complete
Arlington Co.	$8,207,899	40.0	Flow Equalization built; adding BNR
Fairfax Co.-Noman Cole	$10,399,500	67.0	BNR about 35% complete
Pr. Wm. Co. SA-Mooney	$4,879,250	18.0	Phase 1 about 30% complete
Alexandria SA	$12,718,560	54.0	BNR system 25% complete
Purcellville	$1,604,654	1.0	Construction started 7/24
Dale Service Corp. #1	$1,901,057	4.0	Construction began early 8/00
Dale Service Corp. #8	$2,115,053	4.3	Construction began early 8/00

Augusta C. SA-St. Draft	$1,528,146	2.5	Construction started 8/7/00

The projects still under construction are scheduled to all be complete by spring 2002, with several starting their BNR operation in the coming year. Notable actions that have occurred since the 1999 Annual Progress Report include:

- The Augusta County Service Authority signed a $1,528,146 grant agreement for a BNR retrofit project at their Stuarts Draft facility. Bids were recently opened for the construction, and it appears that the grant amount may be reduced slightly based on some changes to the project scope. Construction is scheduled for completion by April 2002.

- SIL Clean Water signed a $1,983,890 grant agreement for construction of their Modular Reclamation Reuse System in Rockingham County. The MRRS went into service in September 2000, taking four existing plants offline – the Towns of Timberville and Broadway, and two poultry producers, Wampler and Rocco Foods. The MRRS has a VPDES permit that allows for a combination of surface water discharge and land application. Depending on the amount of treated flow used in irrigation, this project has the potential to significantly reduce (and possibly eliminate) the discharge of nutrients into the North Fork Shenandoah River from the four plants.

- The Stafford County-Aquia plant became the first to report on annual average nitrogen levels under their grant agreement. For calendar year 1999, the annual average TN discharge concentration was 5.56 mg/l, which is better than their performance requirement of 8 mg/l.

- Two other Shenandoah Valley plants completed their BNR retrofits – the Frederick-Winchester Service Authority Opequon STP and the Harrisonburg-Rockingham Sewage Authority North River STP. Early monitoring results show that the nutrient reduction systems are operating well, and may exceed performance requirements.

- At the DC-WASA Blue Plains STP, construction was completed on their full-plant BNR retrofit. The entire 370 MGD design capacity is now capable of being operated with nitrogen reduction, which includes flow from several Northern Virginia loaclities (Fairfax County contracts for 31 MGD; Loundoun County Service Authority contracts for 13.8 MGD).

- The 2000 General Assembly removed the earmark for $3.35 million in the WQIF that was authorized to purchase additional nitrogen reduction at the Blue Plains STP. Negotiations with DC-WASA for this grant agreement have ceased, and these funds will now be made available to Virginia grantees for their nutrient reduction projects.

C. Interim Nutrient Cap Strategy

With the near completion of the Shenandoah and Potomac River Basins Tributary Strategy, a new process is underway to ensure that nutrient reductions achieved through implementation of the original Strategy are not eroded. This process is known as Virginia's Interim Nutrient Cap Strategy for the Shenandoah and Potomac River Basins.

Development of the Interim Nutrient Cap Strategy is being headed up by a steering committee of state agency staff, regional planners of Planning District Commissions, and representatives from select groups such as Interstate Commission on the Potomac River Basin and the Shenandoah Valley Pure Water 2000 Forum. Staff of the Department of Environmental Quality and the Department of Conservation and Recreation serve as coordinators for this steering committee. This committee has met four times and has established the process and direction for the Interim Cap Strategy.

This team has been meeting since March 2000 to oversee development of the Interim Cap Strategy. The committee determined that the Interim Cap Strategy would be developed through a very localized approach. During early meetings, the steering committee set in motion a process for involving local officials and local representatives even down to the scale of individual jurisdictions, and that the Strategy would be constructed from those very basic building blocks. Two types of meetings were conducted. First, three regional "kick-off" meetings were held for elected officials in the three regions of the watershed, including the Northern Neck, Northern Virginia, and the Shenandoah Valley, to brief local officials and solicit input for development of the Interim Cap Strategy. Next a series of sub-regional focus group style meetings were held with local government staff to discuss specific issues. A total of nine focus group meetings have been held so far in the watershed in order to solicit local input on what additional measures can be taken to maintain a nutrient reduction cap. Three additional focus group meetings are planned.

Since the completion of these local meetings, the information that was gathered has been compiled, and steering committed members are in the process of writing individual sections based on local guidance and the current outline. Various forms of feedback (concept paper, drafts, additional meetings) will be provided to those who participated in local focus groups.

Two meetings were held in October 2000 to garner input and feedback from community watershed and environmental groups, agricultural interest groups and business associations.

The Interim Cap Strategy will identify practices, programs and solutions for capping nutrient loads until the Baywide nutrient reduction goal is reassessed. The Strategy will also serve as an action and options document to assist the state in making final decisions for development of the final Cap Strategy. These decisions will include means of tracking load increases, point source/nonpoint source reduction ratios, nutrient trading options and others.

V. THE RAPPAHANNOCK RIVER AND NORTHERN NECK COASTAL BASINS TRIBUTARY RESTORATION STRATEGY

A. Tributary Strategy Goals

1. Water Quality and Habitat Restoration Goals

Restoration goals were established for improving water quality and habitat conditions by the year 2010. These goals were based on modeling results from the Bay water quality computer model, which simulates how different levels of nutrient and sediment reductions could improve water quality, particularly the amount of dissolved oxygen in the water column and the health of submerged grasses. The two principal restoration goals that were established are:

- to reduce by approximately 50% (actual model prediction is 45%) the annual volume of anoxic water (water that has no dissolved oxygen) in Rappahannock River, and
- to increase by approximately 50% (52% prediction) the density of submerged grasses.

2. Nutrient and Sediment Reduction Goals

The Bay water quality model estimates that reaching these restoration goals will require the following nutrient and sediment reductions in the basin (compared to 1985 total loads):

- Nitrogen: - a 33% reduction (target nitrogen load of 6,949,000 lbs/year)
- Phosphorus: - a 29% reduction (target phosphorus load of 663,000 lbs/year)
- Sediment: - a 20% reduction (target sediment load of 289,000 tons/year).

To address chronic erosion and stream bank instability in the western Rappahannock basin, an additional goal of the Rappahannock Strategy is to promote Governor Gilmore's Conservation Reserve Enhancement Program (CREP) and to:

- Implement CREP in the Rappahannock basin by reestablishing 4,604 acres of riparian buffers (equal to 491 stream miles at a width of 75 feet) and 456 acres of wetlands.

3. Additional Tributary Strategy Goals

The Rappahannock Tributary Strategy also identifies the following goal, which is mostly applicable to the western portion of the Rappahannock basin:

- Remove all stream segments from the 303(d) Impaired Waters list which are impaired as a result of localized pollutant loads in the basin.

B. Tributary Strategy Process and Status

The Rappahannock Strategy was developed using a cooperative process that emphasized local needs and viewpoints. An essential factor in the successful development of the Strategy was the close involvement of the Rappahannock River Basin Commission. The Commission is a legislatively-formed body composed of the state and local elected officials whose district or jurisdiction is completely or partly in the Rappahannock River Basin (two counties in the basin are not members of the Commission). Members of the Rappahannock Basin Commission, the Rappahannock Conservation Council (an affiliation of soil and water conservation districts) and the Rappahannock Technical Review Committee worked diligently over the course of three years to review technical water quality information, represent their constituents and to achieve consensus on effective and balanced solutions. This cooperation led to strong support for establishing water quality restoration goals and identifying needed implementation practices.

The Rappahannock Strategy received formal approval from the Secretary of Natural Resources in August 2000. Identified Strategy nutrient/sediment reduction practices and programs are now available for full implementation under the Water Quality Improvement Fund and other mechanisms.

C. Tributary Strategy Implementation

Implementation efforts under the Rappahannock Strategy will be based on the same level of participation and guidance from local officials, citizens and stakeholders that was used during its development. Many of the stakeholders who participated in the development of the Strategy have agreed to participate in "Implementation Teams" that will help to guide and refine implementation efforts. These teams, headed by the Rappahannock River Basin Commission and the Rappahannock Conservation Council will provide a critical link between state agencies and landowners.

The Commission and the Council jointly sponsored the third annual Rappahannock River Basin Summit on August 23, 2000. To complement past informational-oriented Summits, this Summit was more interactive, giving participants a greater opportunity to provide feedback on barriers and opportunities in implementing the Tributary Strategy.

The long-term success of the Strategy will be monitored by the Rappahannock Technical Review Committee, which serves as a committee of the Rappahannock Commission. The Strategy sets forth the need for two reevaluations to be conducted in the years 2002 and 2005. These reviews will be coordinated among the Technical Review Committee, Implementation Teams, the Rappahannock River Basin Commission and the Rappahannock Conservation Council. The Technical Review Committee will also assist in the larger "Process for Integrating the Cooperative and Regulatory Programs of the Chesapeake Bay and its Tributaries."

1. Nonpoint Source Implementation

For FY 2001, the Rappahannock Watershed is receiving $1.13 million, or one-third of total state agricultural Cost-Share funds. This level of funding, which is higher than any other watershed in the state, will concentrate critical resources to areas and programs deemed high priority based on the Tributary Strategy, model runs, and public input. DCR will work with the seven Rappahannock Soil and

Water Conservation Districts and the Council to allocate this money towards implementation of the Tributary Strategy.

Rappahannock Mini Grant - To promote public awareness of the Rappahannock Tributary Strategy and to encourage public education programs, the Department of Conservation and Recreation is awarding a total of $40,000 in grant monies to community groups, watershed organizations, and local communities. The EPA grant is being issued by DCR as seed money to organizations to encourage capacity building and to develop a public outreach campaign. DCR issued Requests for Proposals to over one hundred representatives of local governments, Soil and Water Conservation Districts, and nonprofit organizations. A total of nine projects are being funded with the $40,000. The projects offer a wide variety of ideas from a television marketing campaign to the formation of a regional stormwater management ordinance workgroup.

2. Point Source Implementation

The Rappahannock Strategy identified the need and benefits associated with the proposal to install biological nutrient removal technology (BNR) at all treatment plants in the basin with flow greater than one million gallons per day (with the exception of one plant that is currently not amenable to BNR). As a result of the Strategy, every one of the identified treatment plants came forward in the recent grant cycle of the Water Quality Improvement Fund to apply for cost-share assistance for installation of BNR. (However, Culpeper has since withdrawn the WQIF application for its wastewater treatment plant until issues of timing and funding are resolved).

The treatment plant upgrades to BNR that are currently under contract negotiation in the Rappahannock basin are listed in table 2.3. As those projects come to completion, additional efforts will be made in cooperation with treatment plant owners to identify options for operating those BNR systems at increased efficiency for nutrient removal.

D. Resource Needs

Costs for nutrient and sediment reduction practices will be paid for using a combination of state, local and private funds. The state cost-share portions of these actions taken over the next ten years (in 1998 dollars) is estimated to be: $8,791,000 for point sources (assuming 50% cost-share level); and $39,366,000 for nonpoint sources (assuming 75% cost-share, including any needed staff and technical resources). These figures are planning-level estimates.

The estimated annual average state cost for implementing the identified nonpoint source management practices is $3,937,000. This figure may increase beyond 2005, as it becomes necessary to implement more costly (per pound of nutrient or sediment removed) management practices in order to maintain, or increase, the annual rates of nitrogen reduction. The costs for implementing Virginia's Conservation Reserve Enhancement Program in the Rappahannock basin are not included in the Strategy, because they are part of a separate budgetary initiative.

For point sources, it is expected that the four treatment facilities in the basin that have already installed nutrient removal systems will make reimbursement requests immediately for $4,048,000 state cost share. One major facility is expected to upgrade to nutrient removal technology in the next one or two years, with a state cost-share request of $2,631,000.

VI. The York River and Lower Coastal Basins Tributary Nutrient Reduction Strategy

A. Tributary Strategy Goals

The York River and Lower Coastal Basins Tributary Nutrient Reduction Strategy was completed in February 2000. The York Strategy is aimed to achieve reductions of Nitrogen 2.3 million lbs., Phosphorus 60 thousand lbs., and sediment 9,000 tons from 1996-97 levels. These reductions, once achieved, are projected to result in a decrease in anoxia of 47%, and an increase of 39% in sub-aquatic vegetation (SAV) density, when compared to 1985 levels, in the York River and Lower Coastal watershed. Best management targets to achieve these goals are outlined in Table 5.

B. Tributary Strategy Process and Status

A public comment draft of the York Strategy was released on September, 1999. Two public meetings were held on September 30th in Ashland and on October 7th in Gloucester Point. A meeting of the state agency tributary team was held on November 5th to review the comments and discuss responses. A response was then prepared and revisions to the strategy document were initiated. In addition, a conference call was held with several representatives from the Hampton Roads Sanitation District on December 14th, at their request, to provide them an opportunity to explain their comments. The strategy document was then edited further and these changes were sent back to the tributary team for review on December 17th. A few additional edits to the point source sections were included to complete the document.

There were minor edits made throughout the strategy document. Most of the changes are in the Executive Summary, the maps on pages 14-18 (easier to read), pages 85-101 (which include six new pages), and Appendix C (toxics section). Also, the connection between the listing of the York and its tidal tributaries on the impaired waters list, and the effort to de-list them, is explained in the document. A two-stage re-evaluation of this strategy is now proposed, part one in 2002 to incorporate the environmental endpoints of the Bay Program, and part two in 2004 to review progress with implementation of the strategy.

C. Tributary Strategy Implementation

Agreement with York River basin point source facilities on the issue of retrofitting sewage treatment plants with Biological Nutrient Removal (BNR) technology was not attained. Point source operators have repeatedly expressed the view that in-basin reductions of point source loads will not significantly improve water quality and living resources in the watershed. Although the model run did not distinguish between point and nonpoint source benefits, reductions from all sources are needed to achieve the projected reductions in the strategy. In response to these concerns by point sources, the Tributary Team asked the EPA Chesapeake Bay Program to conduct a point source only model run prior to the completion of the York Strategy. Staff recommended going forward with the year 2010

BNR/BNR equivalent target in the strategy for point sources with flow capacity of one million gallons per day or more, stressing that it is a voluntary target, and continue to encourage plant owners to implement it. As of September 2000 the Chesapeake Bay Program had not yet conducted the point source only model run requested.

Table 6. York Tributary Strategy Year 96-97 Progress vs. 2010 BMP Coverage Goals

BMP TYPE	UPPER BASIN	MIDDLE BASIN	LOWER BASIN
Farm Plans	53,228 acres 107,328 acres	37,649 acres 38,649 acres	72,619 acres 158,628 acres
Land Retirement	1,375 acres 9,962 acres	2,485 acres 2,685 acres	4,240 acres 25,116 acres
Agricultural Nutrient Management	7,916 acres 11,980 acres	22,837 acres 57,802 acres	38,804 acres 115,967 acres
Urban Nutrient Management	0 acres 250 acres	0 acres 750 acres	500 acres 1500 acres
Stream Protection	57 acres / 57 acres	64 acres / 127 acres	9 acres / 200 acres
Nontidal Stream Restoration	N/A 10 acres	N/A 25 acres	0 acres 50 acres
Grazing Land Protection	1,732 acres 6,363 acres	446 acres 446 acres	376 acres 1,098 acres
Cover Crops	537 acres 28,641 acres	2,836 acres 6,210 acres	3,231 acres 4,790 acres
Grass Filter Strips	78 acres 117 acres	337 acres 674 acres	196 acres 199 acres
Woodland Buffer Filter	1 acre 1 acre	0 acre 0 acre	4 acres 100 acres
Forest Harvesting BMP	1,977 acres 1,977 acres	4,596 acres 4,596 acres	5,392 acres 5,392 acres
Animal Waste Control Facilities	2 systems 2 systems	2 systems 6 systems	3 systems 6 systems
Poultry Waste Control Facilities	7 systems 7 systems	2 systems 2 systems	0 systems 0 systems
Erosion and Sediment Control	85% of disturbed lands controlled	85% of disturbed lands controlled	85% of disturbed lands controlled
Urban Stormwater Management Retrofits	No data in ‘97 2,039 acres	No data in ‘97 17,112 acres	532 acres 10,063 acres
Shoreline Protection	0 linear feet 0 linear feet	0 linear feet 0 linear feet	14,633 linear feet 192,200 linear feet
Marina Pumpouts	0 / 0	0 / 0	29 sys / 34 systems
Septic Connections	No data in ‘97 50 systems	No data in ‘97 200 systems	No data in ‘97 200 systems
Septic Pumpout	No data in ‘97 1,048 systems	No data in ‘97 1,854 systems	No data in ‘97 3,196 systems

Point sources with flow capacity of one million gallons per day or more will be asked to voluntarily employ at least the Biological Nutrient Removal (BNR) level of treatment (for wastewater) or pollution prevention measures (industrial) by the Year 2010.

Costs to implement the York Strategy are estimated at $45,000,000 from 2000-2010, including five full-time personnel amongst the Soil and Water Conservation Districts in the watershed. Total agricultural cost-share funds in FY01 for York Strategy implementation are $737,362. Nonpoint sources account for approximately 80% of the controllable nutrient loads in the watershed. A significant increase in cost-share funds is needed to fully implement the York Strategy. Two point source facilities in the watershed applied for Water Quality Improvement Fund (WQIF) grants this year to accomplish additional nutrient reductions.

Local decision-makers, state agencies, and other key stakeholders in the York and Lower Coastal watersheds have been invited to participate in the York Watershed Forum (Forum). Implementation of the York Strategy will be one of the focuses of the Forum. The kickoff meeting of the Forum was on June 29, 2000, in Ashland. Representatives from several state environmental agencies, Planning District Commissions, local governments, Soil and Water Conservation Districts, and some point sources in the York and Lower Coastal watersheds attended. The Forum plans to meet quarterly, and each meeting will be in a different area of the watershed. The Forum last met on September 22, 2000 in Yorktown.

Once developed by the Bay states and the Chesapeake Bay Program, the Forum will then consider the resulting environmental endpoints for integration into the York Tributary Strategy in 2002, per the Chesapeake 2000 Agreement, discussed in Part II of this report. The revised strategy will be the principal product of the Forum over the next two years.

In 2001, implementation of the York Strategy will focus on progress towards several BMP targets, emphasizing the Conservation Reserve Enhancement Program, existing cost-share funds, Water Quality Improvement Fund and other grant funds, with focus on:

Grass Filter Strips	Woodland Buffers
Animal Waste Control Facilities	Agricultural Nutrient Management Plans
Erosion and Sediment Control	Septic Pump Outs
Shoreline Erosion Protection	Point Source BNR
Urban Nutrient Management	Urban Stormwater BMP Retrofits

York River Basin Mini Grant – To kick start strategy implementation, the Department of Conservation and Recreation is allocating $250,000 ($200,000 state WQIF funds and $50,000 federal Chesapeake Bay Program funds) to enhance cost share funding for private-sector nutrient management planning for farmers in the York River Basin. This initiative will augment the efforts of current state staff involved in nutrient management planning and will provide a key step toward meeting the level of nutrient reductions identified in the strategy.

VII. The James River Basin Tributary Nutrient Reduction Strategy

A. James River Tributary Strategy Goals

In late 1999, staff from the Departments of Environmental Quality, Conservation & Recreation, and the Chesapeake Bay Local Assistance Department prepared a draft goals document for public review and comment. This draft was the culmination of more than one year of work with a James River Technical Review Committee (TRC) composed of representatives from public wastewater treatment facilities, private environmental groups, Soil and Water Conservation Districts, industry and local governments. The TRC considered the results of various Chesapeake Bay Water Quality Model runs as well as other pertinent information. Staff from the Chesapeake Bay Program Office of the U. S. Environmental Protection Agency and state Agencies provided technical assistance to the TRC by analyzing and presenting data from model runs, and by synthesizing living resource information.

State staff worked closely with stakeholders and technical experts to examine the effects of different pollutant reduction scenarios and to develop goals that will improve the water quality and living resources of the James. The levels of expected improvements in habitat conditions were analyzed for different combinations of pollutant reduction. Each combination of actions was then evaluated against the critical measures of practicality, cost-effectiveness and equity.

Four public meetings were held around the James River basin in early 2000 (Lexington, Lynchburg, Newport News, and Richmond) to present the proposed nutrient and sediment reduction goals for the James River Tributary Strategy and to receive public comment. State agency staff compiled and reviewed the written comments received and modified the draft goals document. The Secretary of Natural Resources approved the document in August, 2000.

The document, *Tributary Strategy: Goals for Nutrient and Sediment Reduction in the James River,* recognizes that the James does not have the same level of dissolved oxygen problems resulting from elevated algae levels found in the Rappahannock and York Rivers. The James River does have a higher level of suspended sediments leading to light penetration problems that may restrict reestablishment of aquatic grasses. Goals established for the James River include an annual reduction of 13.2 million pounds of nitrogen, 2.4 million pounds of phosphorus and 180,900 tons of sediments from 1985 levels. The following nutrient and sediment reduction goals have been established for the James River Tributary Strategy:

- Achieve a 9% sediment reduction from the levels that existed in 1985 for the entire basin by the year 2010.

- For all areas draining directly to the tidal fresh portion of the James, Biological Nutrient Removal (BNR) implementation at point sources and an equivalent reduction in nonpoint sources by 2010. This would result in a 32% nitrogen and 39% phosphorus reduction, based on model simulation, in loading to the river from the levels that existed in 1985. Although the model simulation for this recommendation used a uniform BNR treatment level for all plants discharging to the tidal fresh portion, the objective is to achieve the recommended level of reduction in the aggregate point source load. This can be achieved with varying levels of nitrogen and phosphorus removal at the plants, with some operating more stringent treatment than others. This recognizes the varying capabilities and site constraints at the plants, as well as opportunities to cost-effectively enhance treatment where feasible.

- The net nutrient loadings to the lower estuary from all areas should not be allowed to increase and should be capped at 1996 levels. Growth in load coming from areas directly adjacent to the lower estuary should not exceed the reduced load coming from the tidal fresh portion of the river. The resulting zero net increase in loading to the lower estuary will prevent any degradation relative to current water quality conditions.

The living resource improvements associated with the reduction goals as determined by the Chesapeake Bay Water Quality Model are: SAV growth in areas of the tidal fresh James previously identified by VIMS as historic SAV beds, and substantial reductions in chlorophyll levels throughout the estuary. The estimated cost for these improvements is $164 million for point sources and $135 million for nonpoint source BMP implementation.

Two issues will require that the recommended nutrient and sediment reduction goals for the James River be reevaluated in several years:

- The current version of the Chesapeake Bay Watershed Model overpredicts sediment loading in the James River. Future model revisions are likely to correct this.

- The Chesapeake Bay Integration Process, discussed in Section III above.

Further work with stakeholder groups in the basin is planned to develop suggested strategies to meet these goals.

B. Tributary Strategy Process and Status

1. Watershed Conservation Roundtables

Watershed Conservation Roundtables are being organized by the Department of Conservation & Recreation in each of Virginia's major watersheds in cooperation with Soil & Water Conservation Districts (SWCD), other state agencies, local governments, industries, citizens, and existing watershed organizations. The Roundtables will provide a watershed-based forum for stakeholders to participate in:

- defining critical watershed needs,
- targeting problems for solutions,

- providing input into potential management options, and
- developing action plans which will serve as a road map for reducing nonpoint source pollution in the Commonwealth, focussing on cooperative, voluntary efforts.

Due to the diverse sources of nonpoint source pollution and the numerous partners that are involved in its reduction, the Roundtables will have an increasingly important role in coming years.

During this reporting period, significant activity has occurred in the James River basin. Three Roundtables were formed in the Upper, Piedmont, and Lower portions of the James River basin. Steering Committees composed of representatives of the SWCDs in the respective portions of the basin provide leadership for the Roundtables. Roundtable meetings of the Upper and Piedmont James River Watershed Conservation Roundtables were held between May and September, 2000 at which stakeholders identified key issues and concerns for those portions of the basin. Information on these two Roundtables is available at www.jamesriverwatershed.com. SWCDs in the Lower James are working closely with the Hampton Roads Planning District Commission, which already had a similar effort underway.

C. Tributary Strategy Implementation

State agencies will work closely with the Watershed Conservation Roundtables and other stakeholders in the basin to develop specific strategies to meet the nutrient and sediment reduction goals of the Tributary Strategy. Existing nonpoint source pollution reduction programs will provide continuing reductions that will help to meet the identified goals. These programs include Nutrient Management, Urban Programs (which includes erosion and sediment control and stormwater management), Agricultural Best Management Practices Cost-Share funding, the Conservation Reserve Enhancement Program, and pollution reduction projects funded through the Water Quality Improvement Fund and Section 319 of the federal Clean Water Act. These latter two grant sources provide $400,364 in FY2000 funding for projects in the James River basin. Significant progress has already been made in reducing point source phosphorus and nitrogen loads throughout the basin, and this effort will continue under the Water Quality Improvement Fund program.

D. Resource Needs

The James River Tributary Strategy Goals document suggests that a high level of funding will be necessary between now and 2010 to achieve the approved goals. For point sources the estimated cost for additional reductions is $164 million; for nonpoint sources the estimate is $135 million for BMP implementation. These estimates will be refined during the development of specific strategies, however, for planning purposes this equates to a total annualized funding amount of $30 million over a ten year period. These estimates do not include additional staffing needed to manage grants, additional BMP cost-share activities, and technical assistance to stakeholders and SWCDs throughout the basin.

VIII. THE EASTERN SHORE TRIBUTARY STRATEGY

The Eastern Shore of Virginia is an 80 mile long peninsula that contains about 696 square miles of land area with approximately one-half of the land area draining into the Chesapeake Bay. There are seventeen localities in the Bay watershed of the Shore, including Accomack and Northampton counties and fifteen towns. The dominant land uses in the Bay watershed of the Shore are forest and agriculture, with several scattered industrial areas and denser development around the existing towns.

A. Tributary Strategy Goals

1. Living Resource Goal

The living resource goal for the Eastern Shore Strategy was agreed to by the stakeholders during the Spring of 1999. The living resource goal is as follows:

> *Increase the areas and density of Submerged Aquatic Vegetation throughout the Eastern Shore tidal creeks and embayments to historic levels to enable the return of abundant and diverse fish and shellfish populations, which in turn, will help to sustain and improve local economies.*

2. Nutrient Reduction Goal

The nutrient reduction goal for the Eastern Shore Strategy has been identified as an interim goal for 2003. These reduction levels are linked to reasonable assurances of BMP implementation resulting in the following projected reductions by 2003: Nitrogen 22.4%; Phosphorus 41.8%; and Sediment 31.4%.

These nutrient reductions continue to progress as scheduled and are being accomplished primarily through the implementation of agriculture BMPs, working with localities to achieve compliance for erosion and sediment control programs, and active participation of the Public Sanitation Authority to resolve septic system concerns.

B. Tributary Strategy Process

Participants in the *Eastern Shore Tributary Strategy* process included: local officials and stakeholders of Northampton county, Accomack county and the 15 towns in the Bay watershed; The Eastern Shore Soil and Water Conservation District; Eastern Shore RC&D; Virginia Natural Resource Agencies; Natural Resource Conservation Service; Virginia Institute of Marine Science; Virginia Cooperative Extension; Accomack/Northampton Planning District Commission; agricultural producers and local environmental organizations.

Through this diverse team, the living resource goal has been the primary point of focus. The team has met several times over the last year to discuss, define and implement an SAV monitoring program to achieve the living resource goal. The primary objective in this process is to incorporate the many diverse needs of the stakeholders into the process of reaching the set forth goals.

C. Tributary Strategy Implementation

Implementation of the *Eastern Shore tributary Strategy* has been split based on the respective goals, SAV and nutrients. The SAV living resource goal will require extensive monitoring to establish a baseline of water quality conditions. Based on these findings, an action plan will be developed to restore the SAV in the tidal creaks and embayments. Resources committed over the last year have been dedicated to the development of a monitoring plan and implementation of that plan. Current schedule indicates that monitoring, in accordance with the plan, will commence before 2001.

The interim nutrient reduction goal is also a coordinated effort, primarily between conservation agencies on the Eastern Shore. The Eastern Shore Soil and Water Conservation District, through the Agricultural Cost Share program, has been aggressively implementing BMPs, which target the desired reductions. These efforts are coordinated and complimented by the locality efforts to improve Erosion and Sediment control compliance and the Planning District Commissions efforts to coordinate implementation of the Chesapeake Bay Preservation Act.

D. Resource Needs

1. Monitoring

Enhanced water quality monitoring is crucial to the development of living resource and nutrient and sediment reduction goals. The objective is to have at least 3 monitoring stations on five different creeks on the shore. A total cost for the 15 sample stations is estimated at $35,000 per year. It is anticipated that this minimum level of funding will be required through 2010. Virginia's Natural Resource agencies have committed funding for the 2000 cycle. Future funding levels have not yet been determined. The total monitoring funding need beyond 2000 is estimated at $400,000 including a 3% annual escalation. SAV restoration resources cannot be calculated until the first five-year monitoring cycle has been evaluated.

2. Implementation

The cost for installing nonpoint source control BMPs for the Eastern Shore Coastal Basins has been estimated at around $2.8 million to reach the targeted 2003 reductions. Current and proposed BMP treatments include Farm Plans, Nutrient Management, Agricultural Land Retirement, Grazing Land Protection, Stream Protection, Cover Crops, Grass Filter Strips, Woodland Buffer Filter Area, Forest Harvesting, Animal Waste Control Facilities, Poultry Waste Facilities, Loafing Lot Management, Erosion & Sediment Control, Urban Nutrient Management, Urban SWM/BMP Retrofits, Septic

Pumping and Shoreline Erosion Protection. In addition, the largest source of point source nutrient loads on the Eastern Shore has installed a BNR process to reduce its annual nitrogen discharge by 30%.

3. Modeling

The Chesapeake Bay Program Water Quality Model (WQM) is not refined enough to evaluate the water quality of the local creeks of the Eastern Shore. The WQM models the Bay area adjacent to the Eastern Shore, but essentially provides information only for the Bay itself. During the development of the WQM, it was discovered that the water in the tidal portions of the local Eastern Shore creeks have little influence on the water quality in the Bay itself. However, it was also determined that local nutrient and sediment reduction efforts would have a positive affect on local water quality.

Because the WQM cannot characterize the small coastal basins that comprise the Eastern Shore, a water quality model that can accomplish this characterization is needed. The Tidal Prism Model, developed by researchers at Virginia Institute of Marine Science of the College of William and Mary, has been introduced as a potential water quality model for these coastal basins. This model uses information on tidal range and basin geometry along with point and nonpoint source loading to characterize small tidal basins. The estimated cost to acquire land use/land cover data to input into the Tidal Prism Model is estimated around $50,000 per basin. As technology develops, other available models will be considered for their ability to perform higher resolution characterizations of the Eastern Shore small coastal basins.

E. Next Steps

The *Eastern Shore Strategy* will be an ongoing process. Coordinated efforts for the Strategy and other water quality initiatives will be greatly enhanced by the development of the Eastern Shore Watershed Network. Once this Network is formed, teams may be established to work on specific projects concerning watershed issues. These issues include, but are not limited to, Coastal Zone Management, SAV mapping and monitoring, data/information sharing and long-term strategic watershed planning.

Through a more coordinated approach, funding needs and implementation strategies can be prioritized based on a comprehensive watershed management approach. Commitment to the Eastern Shore Watershed Network by Virginias Natural resource agencies is critical to the successful implementation of the tributary strategy.

PART TWO
IMPLEMENTING THE CHESAPEAKE 2000 AGREEMENT

INTRODUCTION TO PART TWO

This part of the annual report outlines the status of the commitments of the new Chesapeake Bay Agreement signed by the Executive Council in June of this year.
The members of that council are the Governors of Maryland, Pennsylvania, and Virginia, the Mayor of the District of Columbia, the Chairman of the Chesapeake Bay Commission, and the Administrator of the Environmental Protection Agency representing all participating federal agencies.

The major portion of this part of the report consists of brief overviews of each of the subsections (a total of twenty-two) falling under the five main topical areas of the Agreement.

1. Living Resources Protection and Restoration
2. Vital Habitat Protection and Restoration
3. Water Quality Protection and Restoration
4. Sound Land Use
5. Stewardship and Community Engagement

Since the Agreement was only recently adopted, this first report is necessarily very preliminary and many details are yet to be developed.

Two of the appendices attached to this report relate to the Bay Agreement. Appendix II-1 contains the new Chesapeake Bay Agreement. Appendix II-2 contains the current table being used by the Implementation Committee of the Chesapeake Bay Program (CBP) to note and track responsibilities for individual commitments and, in some cases, their several components.

I. OVERVIEW OF THE CHESAPEAKE BAY PROGRAM AND AGREEMENTS

A. Nature of the Chesapeake Bay Program

The Chesapeake Bay Program is a cooperative arrangement for addressing the protection and restoration of the water quality, habitats and living resources of the Chesapeake Bay and its tributaries. The Program functions as a forum for developing consensus on system-wide problems which can benefit from cooperative goal setting and associated technical and scientific efforts. The principal forum within the Program is the Executive Council.

Each signatory state determines how it will meet the various commitments, and the approaches to individual commitments often vary greatly among the states. An important basic fact, often misunderstood by many, is that the commitments adopted by the Executive Council are not legally binding. Each commitment is a statement that the signatories will do their best to accomplish a given task, often by a specified time and often in terms of some specific numerical goal.

The Executive Council of the CBP sets ambitious goals. When a cooperative effort such as the Program reaches high it sometimes misses the mark, at least for a time.
Missing goal dates and associated milestones is not taken lightly and is avoided wherever possible. In a cooperative effort such as the CBP, however, goal dates are self-imposed and are a guide and a motivation rather than an absolute.

B. The Three Chesapeake Bay Agreements

The current Agreement is the third in a series of ongoing Agreements designed to guide the cooperative approach to the protection and restoration of the Chesapeake Bay aquatic system and its watershed. Each clearly reflects an evolutionary phase in this unique cooperative regional program.

The first Agreement, signed in 1983, consisted of two paragraphs and simply stated that the signatories would work together toward the restoration and protection of the Bay system. The focus at that time was almost entirely on the main Bay as a receiver of pollutants and as a major habitat shared by many species.

Once the Program made the transition from research (prior to 1983) to implementation, it necessarily became steadily more complex. The 1987 Agreement gave formal direction to that emerging complexity and was notable not only for its breadth but also for the establishment of numerical nutrient reduction goals. Those goals became the single most important driving force in the Program. Both the phosphorus and nitrogen reduction goals are close to attainment. If those goals had not been set in 1987,it is highly unlikely that any of the signatory states would be anywhere near their marks.

The new Agreement – *Chesapeake 2000: A Watershed Partnership* – builds on the 1987

Agreement and once again pushes the limit of what we think is possible to attain. This new Agreement is especially complicated by the direct linkage to one aspect of the federal Clean Water Act, that of Total Maximum Daily Loads, or TMDLs. The approach adopted in the Agreement, when successful, will eliminate the need to establish TMDLs for the Bay and the estuarine portions of its tributaries. By moving ahead in a cooperative manner, the signatory states can meet the intent of the Clean Water Act and retain the kind of management flexibility they consider most useful. The 2000 Agreement also moves into major new areas with the addition of a large number of related commitments that are directed toward minimizing the negative effects of regional growth and development.

II. IMPLEMENTING THE CHESAPEAKE 2000 AGREEMENT

We are in the initial stages of developing preliminary recommendations for strategies for working with local governments and others to find realistic approaches to implementing the commitments of the new Agreement. Wherever possible we will use existing mechanisms as vehicles for working through implementation issues and processes. The planning district commissions, the Rappahannock River Basin Commission, the existing and emerging watershed roundtables and other similar entities offer opportunities for fairly broad scale coordination and integration.

Annual meetings such as those of the Virginia Municipal League, the Virginia Association of Counties, the VMI Environmental Conference, the State Watershed Management Conference, and those of a number of environmental and conservation groups also offer broad scale opportunities.

We will coordinate among the agencies and secretariats of the Executive Branch of state government through a number of inter-agency bodies such as the Watershed Planning and Permitting Coordination Task Force, the VDOT interagency project review committee, the Nonpoint Source Advisory Committee, the Coastal Policy Team and the Virginia Chesapeake Bay Interagency Workgroup that will help ensure that the state agencies and institutions work in a coordinated fashion.

In order to supplement those existing coordination opportunities, state staff will be meeting with small groups of interested stakeholders in an effort to find the most equitable, effective and cost-efficient ways to implement the various commitments. Some of the coordination also is likely to require setting up special-purpose ad hoc groups to address particular commitments that will be especially difficult to accomplish. The purpose and composition of those groups will evolve in the next several months. In all cases moving ahead with implementation will be as inclusive and as interactive a process as possible.

In addition, the Commonwealth will work with local governments and others to assist in integrating the implementation of the commitments into local programs and activities in ways that will minimize the costs to all concerned and emphasize local control and the varieties of local approaches. The associated issue of marshalling the resources necessary to meet the numerous commitments of the new Agreement is one that will require continuous examination and innovation. Existing state agency staff will be responsible for carrying out most of the tasks where the state has a direct implementation responsibility, and no significant near-term increases in state staff for those purposes are expected. Multiple-agency teams and other combinations of existing state staff resources will be the primary means of making the best use of existing state staff. Existing state and federal cost-share and grant programs also will be examined to determine how best to use those limited resources to meet the challenges of the new Agreement.

The primary focus of the Commonwealth is on the key tasks necessary to accomplish each commitment. Any date associated with a given commitment also is clearly an important consideration. However, the availability of resources will have a major impact on the ability to meet individual commitments by their deadlines. The most critical dates found in the Agreement are those associated with removing the Chesapeake Bay and its tidal tributaries from the EPA list of impaired waters as they have been set specifically to carry out tasks essential to eliminating the need to impose TMDLs on those waters.

The development of *Chesapeake 2000: A Watershed Partnership* took nearly two years to complete, and is the result of very significant public input from across the watershed. It is the most comprehensive restoration guidance document for the Chesapeake Bay to date. The Commonwealth of Virginia has begun the implementation of the new Agreement and is firmly committed to continued achievement as a partner in the Chesapeake Bay Program.

III. REVIEW OF SECTIONS AND COMMITMENTS

The new Agreement contains five topical sections with a total of twenty-two subsections. The following portion of this report briefly outlines initial information related to the implementation of the individual subsections. Much of this information is very preliminary as the process of moving ahead with the implementation of many of the commitments is just in the first stages. Prior to the adoption of the new Agreement a considerable number of state agencies and institutions were involved in varying ways in carrying out the 1987 Agreement and its associated plans, strategies, directives and policies. The greater scope of the new Agreement expands that involvement by increasing the level of effort that will be required and drawing additional agencies into the process. Table 7, which follows this section of the report, provides an initial look at the range of participation by state agencies and institutions in the implementation of the twenty-two subsections of the new Agreement.

A. (1.0) Living Resources Protection and Restoration

This section of the new Agreement addresses oysters, exotic species, fish passage and migratory and resident fish, multi-species management and crabs.

(1.1) Oysters

The Chesapeake 2000, agreement sets an ambitious goal of achieving at least a ten-fold increase in native oysters in the Bay by the year 2010. By 2002, a strategy must be developed and implemented to achieve this increase.

There is Baywide consensus that a strategy of rebuilding ideal broodstock sanctuary areas (primarily 3-dimensional reefs) throughout the Bay should be used, along with the restoration of nearby harvest production**.** This Baywide strategy is modeled after the strategy developed and implemented by the Commonwealth for the past seven years. Moreover, oyster aquaculture and oyster disease management strategies should be implemented in the Bay, and Virginia has been the leader in these areas. A baywide monitoring strategy to track this goal is currently being developed that builds directly upon what is now being conducted in Virginia.

Significant progress has begun on this oyster restoration goal, with increased funding from partnerships such as the Virginia Oyster Heritage Program. The Marine Resources Commission is working closely with the Department of Environmental Quality, VIMS, NOAA, the Corps of Engineers, the Chesapeake Bay Foundation, and other private partners to attain new funding sources. Increasing and consistent funding sources will be required to attain the goal.

Quantities of available cultch and sources of shell for reef construction and oyster bed restoration could limit the progress toward this goal. Alternative cultches are being investigated, along with initiating a permit process to harvest fossil shells in the James River.

There continues to be significant interest by citizens in growing oysters, and the contribution of this activity toward meeting the oyster goal is being tracked. Both MRC and VIMS continue to investigate and make progress toward our understanding and management of oyster diseases.

(1.2) Exotic Species

The goals for exotic species management call for the need to develop a program to address ballast water discharges, further define threats from non-native species, and develop management plans for any such species which are considered problematic.

In recent years there has been significant concern that ballast water discharges could lead to the introduction of non-indigenous species in the Chesapeake Bay. The recent discovery of the Veined Rapa Whelk is but one example. As such, a portion of the commitment related to exotic species calls on the Bay Program partners, through the formation of a Task Force, to work cooperatively with the Coast Guard, the ports, the shipping industry, and environmental interests to help establish and implement a national program to reduce, and where possible, eliminate the threat of non-native species carried in ballast water. Furthermore, the Task Force is charged with the development of an interim voluntary ballast water management program for the Bay and its tributaries.

Task force representation includes resource agencies, the Virginia Port Authority, shipping interests and environmental organizations. As planned, the Living Resources Subcommittee of the Chesapeake Bay Program will coordinate this work. Any implementation requirements will be a result of Task Force recommendations.

Through the Living Resources Subcommittee, the Commonwealth will also be working with the other Bay Program partners to identify and rank invasive species that present a threat to the Bay's ecosystem. This effort is intended to result in the development of management plans for such species. Implementation requirements will be dependent on the specific species involved and any identified management plan requirements.

(1.3) Fish Passage and Migratory and Resident Fish

This subsection of the Agreement addresses the reiteration or reassessment of several existing Program goals, finalization and documentation of current status of the targeted resources, determination and documentation of strategies and proposed actions, and setting of tributary-specific targets and schedules, all in pursuit of the restoration of fish passage and the restoration of target levels of resident and migratory fish species.

Virginia's portion of the ten-year Bay-wide fish passage restoration goal of 1,357 miles is 415.5 miles. Virginia had reopened 37 miles prior to the setting of the ten-year goal via fish passage projects at Walker's, Manchester, Brown's Island, and Harrison Lake dams. Since 1993, an additional 153.6 miles have been reopened (William's, Boshers, Chandler's and Harvell dams), for a total of 190.6 miles to date. Virginia's portion of the ten-year goal would be achieved by completing passage projects at the Abutment and Brasfield dams on the Appomattox River (121.4 miles), Embrey Dam on the Rappahannock (70.6 miles), Ashland Mill Dam on the South Anna (9 miles), and the Ashland Water Supply Dam on the South Anna (28 miles), for a total of 419.6 miles reopened.

The Department of Game and Inland Fisheries maintains a statewide fish passage impediment database, which currently is being updated. GIS coverage of anadromous fish spawning and nursery areas and migration routes is being developed through federal/state interagency review of the data layers initially created by the DGIF. In accordance with the Agreement, the Commonwealth's commitment to fish passage and habitat restoration are not restricted to providing passage for anadromous or catadromous fishes; resident native fish populations also require fish passage past impediments to maintain viable populations, or to serve as hosts for other animals (e.g., freshwater mussels) that require specific fish species for successful reproduction. Fish passage priorities are determined by selecting those projects which will provide the greatest benefits to the resident and migratory fish stocks, while maximizing habitat restoration.

Of the five major anadromous fish species associated with Virginia waters (striped bass, American shad, blueback herring, alewife and hickory shad), there exists quantitative information on the striped bass stock, but few quantitative estimates of stock trends exist for the other anadromous species. A fish passage monitoring program is in place at Boshers Dam, and American shad are being documented as annually using the fishway. In addition, spring adult and summer-fall juvenile sampling above and below several dams (including Boshers) are accomplished to assess passage and spawning success. Monitoring of target species on the Rappahannock, James, and Pamunkey rivers contributes to assessment of current stocks and trends of shad and herring. Fish passages and resultant increases in spawning acreage can be used to estimate potential standing stock, as had been previously compiled during the development (1987) of the Anadromous Fish Restoration Plan.

Working target populations have been set for American shad in the James River and for shad and herring in the Appomattox and Rappahannock rivers. The Commonwealth participates in the CBP Fisheries Management Plan workgroup and other associated groups which will need to determine practical tributary specific estimates of target stock sizes for migratory fish. Because striped bass is considered a restored population, and current monitoring emphasis exists for striped bass, efforts should be directed principally to the alosine species. Only recently have investigations into biological characteristics (size, sex and age composition) in the major tributaries (James, Rappahannock and York) been conducted on the spawning runs of American shad. It will take several more years of data to assess stock trends of American shad in these rivers. No similar monitoring occurs for river herring or hickory shad, though tagging efforts are directed towards assessing the health of the striped bass stock. Current American shad stocking efforts focus on reintroduction of this species above Boshers

Dam in the upper James River. Future American shad restoration efforts will focus on the Rappahannock and other rivers. VDGIF, in cooperation with the VMRC and USFWS, has conducted a hatchery propagation project for American shad since 1992. To date, 61.0 million tagged shad fry have been released, with the James receiving 45.5 million and the Pamunkey 15.4 million. Monitoring studies indicate that fish of hatchery origin and stocked via this project made up 79.9% and 5.0% of the spawning populations in the James and Pamunkey rivers, respectively. As stocked year classes in both rivers recruit to the spawning populations, 1 in every 400 shad fry introduced by this project is expected to return as an adult, with the full impact of these introductions expected to occur by 2003.

Overall, a significant acceleration of efforts would be necessary to achieve the research, planning, fish passage, habitat restoration, stocking, and monitoring objectives of the Fish Passage and Migratory and Resident Fish commitments.

(1.4) Multi-Species Management

This section of the commitments focuses on the need to assess the effect of filter feeders on Bay water quality and habitat for the development of multi-species management plans for target species. In addition, the agreement highlights the need to revise fishery management plans to incorporate ecological, social and economic considerations along with multi-species management and ecological approaches.

While filter feeders such as menhaden, oysters and clams are often cited for their beneficial effects on water quality and habitat, no quantitative information exists on optimal biomass levels that are necessary to maximize their benefits to the ecosystem. Initially, process based models that represent the trophic (food-web) interactions of various populations, which may include harvest from fisheries, will need to simulate the effects of various first-order interactions of a multi-species assemblage. These models along with existing results from multi-species bio-energetic models and ongoing studies of tropho-dynamic relationships among species assemblages will provide guidance for the assessment of the relationships of filter feeders and the Bay ecosystem, by 2004.

Following the initial modeling approaches, more complex interactions can be simulated, and the food web model can be broadened to include lower trophic levels (e.g., plankton) to simulate ecosystem dynamics. These sensitivity analyses will afford the Bay Program partners, through the Living Resources Subcommittee and its newly formed Fisheries Management Planning and Coordination Workgroup, a basis for developing ecosystem-based multi-species management plans by 2005. Current levels of effort would have to be significantly increased in order to reach this objective and to incorporate non-biological components (social, economic) into a model framework, and, ultimately, revised FMP's.

(1.5) Crabs

This section of the new Bay agreement calls for the establishment of harvest targets for blue crabs and the implementation of complementary fishery management plans by Virginia and Maryland.

This effort is intended to restore the health of the spawning biomass as well as the size and age structure of the blue crab population.

Based on its life history and use of the full extent of the bay, the blue crab is considered as a Chesapeake Bay-wide unit stock. As such, a bay-wide target based on exploitation is considered appropriate. The Bi-state Blue Crab Advisory Committee (BBCAC) and the Chesapeake Bay Stock Assessment Committee (CBSAC) have expended a significant amount of effort aimed at the development of appropriate fishing limits (thresholds) and targets. Exceeding a threshold means the biological stability of the stock may be compromised, and a target represents some level of harvest, effort or fishing mortality that is less than the threshold amount. Appropriate targets have not been finalized by the BBCAC and CBSAC. However, the following biomass and spawning stock thresholds were recently adopted by the BBCAC. The biomass threshold is just under 30 million pounds, and the spawning stock threshold corresponds to a level of spawners equal to 10% of a theoretical, virgin (no fishing occurs) stock. Targets are scheduled for adoption by bay jurisdictions later this year. Further, periodic analytical assessments of the biological stability of the blue crab resource will be conducted and the committees will re-evaluate the appropriateness of the initial target fishing mortality rate. The initial assessment will be concluded by December 2001.

Target fishing mortality rates, harvest thresholds or effort levels will promote the biological stability of the blue crab resource. Fishery-based targets will help promote a biologically stable spawning stock, size and age composition on a long-term basis. Adoption of individual or various bay-wide targets encourages flexibility in conservation management strategies among the bay jurisdictions, as there are both similarities and differences in the fisheries and stock compositions among the Bay jurisdictions.

B. (2.0) Vital Habitat Protection and Restoration

This section of the Agreement addresses submerged aquatic vegetation, watersheds, wetlands and forests.

(2.1) Submerged Aquatic Vegetation

The Chesapeake 2000 agreement calls for a recommitment of the existing goal of protecting and restoring 114,000 acres of submerged aquatic vegetation in the Bay and its tributaries. Furthermore, the agreement calls for a revision of this goal by 2002 in order to reflect historic SAV abundance and to revise strategies to accelerate protection and restoration efforts.

The 1998 SAV survey conducted by VIMS, which represents the most recent complete set of data, documented 63,467 acres of SAV throughout the Bay. This is up from 38,197 that existed in 1994, the first time a complete survey was conducted, but less than the 73,047 acres recorded in 1993. Although there have been fluctuations in recent years, SAV coverage for 1999 appears to have increased to an estimated 68,125 acres. These changes appear to be somewhat dependent on water quality from year to year, possibly as a result of fluctuations in annual rainfall and pollutant runoff.

So that we can maintain this trend, protection of SAV will need to continue through regulatory programs that manage the use of submerged lands and fishery activities, and through the continuation of water quality improvement programs. This will include the implementation of nonpoint source (NPS) pollution reduction elements of Virginia's Tributary Strategies to reduce nutrients and sediment loads that affect SAV, as well as nutrient reductions from point discharges. Restoration efforts will also be dependent on improvements in water quality as well as the continuation of research devoted to SAV transplantation and the development of funding sources and voluntary programs. In addition, it will be important to continue annual monitoring conducted by VIMS in order to track progress and changes in SAV distribution.

As planned, the Living Resource Subcommittee (LRSC) of the Chesapeake Bay Program will coordinate the identification of a new SAV goal among the Bay Program partners as well as the development of strategies to accelerate restoration efforts.

(2.2) Watersheds

This subsection of the commitments generally addresses the implementation of watershed management plans and stream corridor restoration at local scales. The 5 commitments in this subsection address local watershed management by (1) developing and implementing locally supported watershed management plans; (2) developing guidelines to ensure the aquatic health of stream corridors; (3) selecting pilot projects that promote stream corridor protection and restoration; (4) including stream corridor aquatic health information in the "State of the Bay" report; and (5) developing stream corridor restoration goals based on local watershed management planning.

In addition to the state participation detailed in Table 7, local governments, Soil and Water Conservation Districts, the U.S.D.A. Natural Resources Conservation Service (NRCS), Watershed Conservation Roundtables (also called Watershed Forums or Watershed Councils), local watershed organizations, and community groups also will have indispensable roles to play in achieving these commitments.

Some of the work reflected in these commitments overlaps with ongoing programs of the various participating agencies. However, other commitments involve new work. It is expected that these commitments will be accomplished by established deadlines through continued or enhanced implementation of existing programs. Among the many agency programs that will be employed to achieve these commitments are the Chesapeake Bay Preservation Act program, Erosion and Sediment Control program, Stormwater Management program, nonpoint source best management practices programs, Tributary Strategies, various agency Geographic Information Systems, Water Quality Improvement Fund, Clean Water Act Section 319, Conservation Reserve Enhancement Program, DEQ ambient water quality and biological monitoring program, and Better Site Design initiative.

(2.3) Wetlands

This subsection of the Agreement addresses the need to achieve both no-net loss of regulated wetlands as well as a net gain through wetlands restoration. In addition, this commitment calls for the Bay Program partners to provide information and assistance to local governments regarding wetlands preservation plans and to assess the effects of climatic change on wetlands.

During the last legislative session the 2000 General Assembly modified and expanded the state's regulatory nontidal wetlands program. Those changes, along with the Virginia's existing regulatory tidal wetland program, will make it much easier to "Achieve a no-net loss of existing wetlands acreage and function in the signatories' regulatory programs." However, in order to meet the agreement commitment, permitted impacts will need to be replaced through compensation requirements, including the use of mitigation banks where appropriate or wetland creation projects. Furthermore, tracking of permitted activity will be necessary to evaluate progress toward meeting this commitment.

The commitment to achieve a net gain in wetland resources will be greatly assisted with the implementation of a voluntary nontidal wetlands restoration program currently being developed by the state government. In addition, the existing Virginia Conservation Reserve Enhancement Program (CREP) seeks to enhance water quality through the implementation of riparian buffers, filter strips and wetland restoration. The CREP goal is to restore wetlands on 4,500 acres statewide with 3,000 acres in the Chesapeake Bay watershed. This restoration is to be accomplished by the end of 2004.

Providing information and assistance to local governments and community organizations for the development and implementation of wetlands preservation plans as a component of local watershed management plans will be accomplished in part through the working relationships the field staff of CBLAD, DCR, DGIF, MRC and VIMS have established with local governments and groups. Accomplishing this commitment would require a significant acceleration in state agency efforts. Additional opportunities for coordination exist through the implementation of the tributary nutrient reduction strategies and the activities of river basin commissions and watershed conservation roundtables.

Exploring the possible impacts of climatic change and subsidence on tidal wetlands will be an activity coordinated through the Scientific and Technical Advisory Committee of the CBP.

(2.4) Forests

The new Agreement reconfirms the Commonwealth's commitment to the 1996 riparian forest buffer goal agreed to by Governor Allen. As of this writing we are well ahead of our schedule to meet that goal.

In addition to the state participation detailed in Table 7, the Virginia Geographic Information Network, the Land Conservation Foundation and the Virginia Outdoors Foundation also will be involved. A very strong partnership exists between state and federal conservation agencies related to this goal. Central coordination is accomplished through the Riparian Working Group, which is chaired by the Department of Forestry.

The development and implementation of the Conservation Reserve Enhancement Program (CREP) in Virginia has, for all practical purposes, ensured that this goal will be reached ahead of schedule. Technology transfer to landowners by understaffed state and federal agencies continues to be the major stumbling block to the full accomplishment of this goal and program. The establishment of a new, expanded goal should encompass sound science attributable to reliable geographic-based information. The easiest buffer installations will occur first**.** Achieving an expanded goal would require an acceleration of state agency efforts. If full accomplishment in all land use categories is desired additional effort in urban areas would be required. This would result in interacting more fully with the land development industry and could lead to developing requlatory measures.

Conservation of forest and other buffers is one of the three main goals of each Bay state's buffer commitment. However, no defined numerical goal was given, so success will be difficult to measure. Significant advances have been made with regard to this goal by way of House Bill 1419 which allows the elimination of tax on those riparian areas and wetlands which have conservation easements. An enhancement can be achieved with this legislation by eliminating the need for a qualified easement to obtain the tax relief. Also, CREP contains an easement portion so as to allow these riparian areas to be conserved as well as restored. Conservation easements in general are receiving more attention and, in turn, riparian areas are being conserved more frequently. Along with the continuing implementation of the Chesapeake Bay Preservation Act, there needs to be a vigorous education and marketing program on the value of streamside forest and other buffers. This would require an acceleration of state agency efforts, which could be coordinated by the Riparian Work Group.

Promoting the expansion and connection of contiguous forests through conservation easements, greenways, purchase and other methods of land conservation requires approaches that are voluntary and are based on a willing buyer/willing seller concept. The Bay Program, along with other governmental entities, has specifically identified forests as necessary to ensure environmental protection and maintain an appropriate "quality of life" for the citizens of the Commonwealth. The Virginia Land Conservation Foundation and Virginia Outdoors Foundation are the entities directly involved in acquiring conservation easements. Funding for both entities has increased in recent years. Numerous other state agencies acquire land through purchase or donation.

The Virginia Geographic Information Network (VGIN) plays a key role in the facilitation of data crucial to this goal. As of this writing, each agency possesses different land use data sets which lead to an incomplete view of Virginia's forest resources. Furthermore, those land use data differences leads to a separation in thinking about what is important for conservation purposes. Therefore, greater coordination will be needed to achieve this goal.

C. (3.0) Water Quality Protection and Restoration

This section of the Agreement addresses nutrients and sediments, chemical contaminants, priority urban waters, air pollution and boat discharge.

(3.1) Nutrients and Sediments

This subsection of the Agreement contains five elements relating to nutrients and sediments.

Four of the elements in this section deal with the development and implementation of tributary specific restoration plans. As a partner in the Chesapeake Bay Program the Commonwealth, through its Governors, has made a series of commitments to the protection and restoration of the Bay and its tributaries. Those commitments were complemented by the Virginia General Assembly's passage of tributary strategy legislation in 1996 (Sections 2.1-51.12:1 through 2.1-51.12:3 of the Code of Virginia). Virginia is approaching the 40% nutrient reduction goal in the Shenandoah/Potomac watershed, and the process is well underway to develop an Interim Nutrient Cap Strategy. Lower Tributary Strategy goals were approved for implementation of point and nonpoint reductions to be achieved by 2010.

Sediment reduction has become an important element in the tributary strategies and in the new Agreement. As with the reduction of nutrients, the long-term costs of sediment reduction will be significant. A scientific and technical issue yet to be resolved is that of the significance of the existing sediments lying at the bottom of the Bay and its tributaries. Sediment reductions from BMPs are effective at reducing run-off loads but have no impact on "in place" sediments from past practices. If it were to be determined that "in-place" historical sediment loads or resuspension of those in shallow tidal waters are the primary factors affecting water clarity, then the goal and the agreed upon approach to that goal would have to be reconsidered.

The implementation of the individual tributary strategies are long-term commitments involving significant resources from the state, citizens, local governments and service authorities. The basic implementation approach being taken by the Commonwealth is to maintain existing regulatory and voluntary cooperative programs that are currently being utilized for both point and nonpoint sources. The Erosion and Sediment Control (ESC) law and the Stormwater Management (SWM) law mandate review and evaluate the effectiveness of local and state agency implementation of ESC programs and their consistency with the State Law and Regulations approved annually by the Soil and Water Conservation Board (SWCB). The Chesapeake Bay Preservation Act requires the Chesapeake Bay Local Assistance Board to ensure that provisions of the Act and associated regulations are effectively implemented by state agencies and local governments in Tidewater Virginia. However, nutrient and sediment reductions required to attain water quality standards may require the revision of existing tributary strategies. While Virginia strives to push for strong public involvement in the decision-making for this program, nutrient and sediment reductions remain a challenging directive.

This subsection also calls for the adoption of revised Water Quality Standards subject to Virginia's Administrative Process Act. Currently, the Commonwealth is revising the Water Quality Standards regulation (9 VAC 25-260) to update the criteria for dissolved oxygen. Once again, strong public involvement is an essential element in this process.

(3.2) Chemical Contaminants

This subsection is directed toward fulfillment of the commitment made by the Commonwealth of Virginia when the Chesapeake Executive Council adopted the *Chesapeake Bay Basinwide Toxics Reduction Strategy* in January 1989, and will be reaffirmed in 2000 through directives outlined in the *Chesapeake Bay Basinwide Toxics Reduction and Prevention Strategy*. The Commonwealth is enhancing the toxics component of the monitoring program in support of the Toxics Characterization in the tidal tributaries. In addition, there are programs throughout the State such as the Stormwater Management, Pollution Prevention, and Integrated Pest Management Programs in support of this directive.

(3.3) Priority Urban Waters

This subsection of the Agreement deals with restoration efforts in the Anacostia River, Baltimore Harbor, and Elizabeth River. The Commonwealth has been and will continue to be actively involved in the ongoing Elizabeth River Project.

(3.4) Air Pollution

This subsection of the Agreement contains a commitment to assess the effects of air pollution on the Bay ecosystem and to help establish reduction goals. Currently, the program uses federal EPA pass-through funds and voluntary efforts towards a "no-net discharge" approach implemented through Pollution Prevention and other programs. While the state maintains monitoring programs, it is beyond their scope to "..assess the effects of airborne nitrogen compounds and chemical contaminants on the Bay ecosystem…" This particular function has been conducted by federal agencies, principally the EPA and programs funded by the Chesapeake Bay Program. Addressing the impacts of air pollutants from statewide sources to local waters would require an expansion of existing efforts.

(3.5) Boat Discharge

The approach being taken is to use Clean Vessel Act funding to increase the number of pump-out facilities and work with the Clean Vessel Act Coordination Committee to include stakeholder support. While EPA in coordination with DEQ establishes "no discharge zones," input from other agencies and institutions will be used to guide this process. Additional action is being implemented through Pollution Prevention Programs and the Clean Marina Program. While this remains a challenging directive, the Commonwealth continues to build stakeholder support to provide guidance. However, additional resources may be needed to more effectively manage the growth and operation of pump-out facilities. Improved coordination among agencies that monitor and regulate pump-outs and those which implement solid waste programs will also be addressed.

D. (4.0) Sound Land Use

This section of the new Agreement addresses land conservation; development, redevelopment, and revitalization; transportation and public access.

(4.1) Land Conservation

This subsection of the commitments focuses generally on identifying and permanently preserving the Bay's most valued lands through a range of land conservation mechanisms that include improved land-use planning and land acquisition or easements. Specifically, these commitments aim to permanently preserve from development 20 percent of the land area in the watershed by 2010. The 5 commitments in this section address land conservation by (1) assessing the Bay's resource lands; (2) providing revenue to land acquisition programs; (3) permanently preserving from development 20 percent of the land area in the watershed by 2010; (4) providing technical and financial assistance to local governments for land-use planning and sustainable use; and, (5) developing a GIS system to assist with both tracking and targeting of preserved lands.

In addition to the state participation detailed in Table 7, the Virginia Land Conservation Foundation and the Virginia Outdoors Foundation also will play key roles. Local governments and nonprofit land conservation groups will also have a lead role to play in achieving these commitments. The support of the Governor and the General Assembly will also be critical for the success of these land conservation commitments.

Many of the concepts embodied in these commitments are already being pursued by the Commonwealth in existing land conservation programs. Where new opportunities exist they are being integrated when possible. For instance, the DOF is seeking approval this year for the federal Forest Legacy program. This program is administered through the U.S. Forest Service and allocates a grant to a state to purchase conservation easements or land that has environmentally significant forest resources. With the support of the Governor and the General Assembly and the assistance of the state's federal, local, and private partners, the commitments may be accomplished by the established deadlines.

(4.2) Development, Redevelopment and Revitalization

This subsection of the commitments focuses generally on implementing sound land use planning and practices that address the impacts of growth, development and transportation on the watershed. Specifically, these commitments aim to reduce harmful sprawl development of forest and agricultural land in the watershed by 30 percent. The 13 commitments in this section address preventing or minimizing harmful impacts to water and air quality and habitat by promoting and removing impediments to low impact, "sustainable" development; promoting redevelopment and infill development where adequate infrastructure already exists; improving planning, assessment and prediction tools; providing more and better training and information; assuring that existing regulatory programs are achieving intended levels of implementation and expected results; improving wastewater treatment options; and improving and increasing the use of stormwater retrofit practices.

In addition to the state participation detailed in Table 7, the Virginia Land Conservation Foundation and the Virginia Outdoors Foundation will be involved in these efforts. Local governments will also have an indispensable role to play in achieving these commitments.

Some of the work reflected in these commitments overlaps with ongoing programs of the various participating agencies. Accomplishing some of the commitments would require accelerated efforts. Several involve the need for additional legislative authority. Most of these commitments will be accomplished by established deadlines through continued or enhanced implementation of existing programs. Among the many agency programs that will be employed to achieve these commitments are the Chesapeake Bay Preservation Act program, Erosion and Sediment Control program, Stormwater Management program, various agency Geographic Information Systems, Enterprise Zone program, Community Development Block Grant program, Brownfields program, Better Site Design initiative, Source Water Assessment program, Watershed Roundtables, and Water Quality Improvement Fund.

However, Virginia faces a number of issues in achieving several of the commitments in this sub-section using only existing programs, resources, and legislative authorities. The commitment regarding review of and possible changes to State tax policies, will definitely necessitate the involvement of the Governor and General Assembly, since none of the agencies routinely involved in the implementation of these programs has any authority over the tax code. Also, the commitment regarding evaluation of local implementation of stormwater management, erosion control, and Chesapeake Bay Preservation Area programs cannot be accomplished thoroughly by the established deadline without an accelerated effort by the involved agencies. Similarly, a significant acceleration will be necessary if DEQ is to be able to restore the 30-40 sites each year called for by the commitment regarding Brownfield restoration and development.

(4.3) Transportation

This subsection of the Agreement addresses the coordination of transportation and land use planning, reducing the dependency on automobile travel, purchase of resource land easements and stormwater management areas adjacent to highway projects, and encouraging the use of technologies that reduce vehicle emissions.

Under state law in Virginia land use decisions are almost entirely the responsibility of local governments. Consequently, in Virginia local governments are the primary level of government that address the coordination of transportation and land use planning. The primary mechanisms used by the local governments for coordination are the planning district commissions (PDCs) and the metropolitan planning organizations (MPOs). Each local government programs all transportation projects on the secondary and urban systems. The Commonwealth will continue to work with local governments, the PDCs and the MPOs to encourage greater coordination of transportation and land use planning.

The Virginia Transportation Development Plan, which is a new approach in transportation programming, is the result of the Virginia Transportation Act enacted into law by the 2000 General Assembly. This programming document is composed of two phases, one that identifies projects which are funded and being built and the other phase which identifies projects that are being considered and will only move forward if deemed feasible. While all of these projects must comply with state, and in many cases federal, environmental guidelines, the control of the associated land use decisions will remain almost entirely a local government responsibility under state law. In addition, each state is federally mandated to develop a statewide comprehensive multimodal transportation plan. Virginia’s Statewide Intermodal Long-Range Transportation Policy Plan, approved in 1995, is currently beginning the process of being updated. This policy-planning document covering a twenty-year planning horizon takes a comprehensive approach to intermodal transportation activities statewide. Both state and local governments are encouraged to have the opportunity to participate in this open process.

There are a growing number of ways in which alternatives to automobile travel are being encouraged and supported. The Tentative Virginia Transportation Development Plan would allocate $369 million for rail and bus operations in this year alone. Other special grants include funding for transit and advanced vehicle programs and bike/pedestrian programs as well as $997,000 in federal funds to DCR for development of motorized and non-motorized trails and trail head facilities. As a part of the Commonwealth's E-Government initiative state agencies are in the initial stages of systematically incorporating telecommuting as a workforce element. Despite these significant efforts it will be very difficult to meet this part of the commitment by 2002 without additional state-level direction and legislation.

VDOT currently purchases easements, as necessary, for specific transportation related purposes. VDOT will consider the use of federal transportation funds for the purchase of easements as project specific compensatory mitigation proposals. VDOT will continue to implement stormwater management features in accordance with Virginia's Stormwater Management law.

The Commonwealth has made advances in fleet management through the use of alternatively fueled vehicles. Other possible advances include "congestion improvement" funding to metropolitan planning organizations (MPOs) and "smart roads". Despite the above any significant progress in this area probably will require significant incentives in the way of tax credits, air permits, etc.

(4.4) Public Access

This subsection of the commitments focuses primarily on enhancing public access to the Chesapeake Bay and its tributaries and in enhancing stewardship and educational information provided at public access sites. Specifically, public access is to be enhanced by increasing the number of access sites by 30% by 2010 and the number of miles of designated water trails by 500 miles by 2005. The stewardship, educational, and interpretive component is to be accomplished through partnerships and by improving the information provided at recreational, historic, cultural, and natural access sites in the

Bay watershed. Local governments as well as citizens and user groups will have to play a key role if these commitments are to be achieved.

It is anticipated that Virginia's portion of the water trail goal will be met by initiatives currently under way. The enhancement of interpretive and stewardship information is an on-going process. The agencies are continuing to provide new information and signage as access facilities are developed and in conjunction with major resource lands managed by DCR and DGIF that are made available for public use. The commitment to develop partnerships with at least 30 sites to enhance placed based interpretation by 2003, is an out-growth of the National Park Services new Gateways program. This program funded 10 gateway sites this year and should do at least that many in each of the next two years. Since each site involves a partnership to enhance interpretation, this goal should also be achieved.

The goal that will be most difficult to accomplish is the 30% increase in access sites by 2010. Public access sites require funding to acquire and/or develop as well as to maintain once developed. Virginia's portion of this goal is about 60 new sites. Meeting this commitment will require close coordination among the resource agencies and local units of government as well as additional funding. The amount of additional funding will be contingent on what can be made available through existing grant programs to support this effort, local participation, and opportunities to enhance access on existing state and federal lands which could be implemented in meeting this commitment.

E. (5.0) Stewardship and Community Engagement

This section of the new Agreement addresses education and outreach, community engagement, government by example and partnerships.

(5.1) Education and Outreach

The new Bay Agreement was developed with considerable input from citizens throughout the basin. In identifying key issues to be included in the new agreement increasing public outreach and education was the #2 priority listed. The seven commitments in this subsection deal with making information sharing, public outreach and education a priority in future Bay Program efforts. For example, one commitment places special emphasis on outreach to minorities who have not been engaged in Bay activities in the past, while another calls for using the latest communications technologies.

All Bay Program partners, including Virginia, have a communications and outreach responsibility to this watershed-wide effort. The Communications and Education Subcommittee is taking a lead in developing strategies on how all partners can become more involved in more effective outreach. Included in these efforts will be researching how the CBPO can assist and provide tools to state agencies and others who are already interacting with key target audiences including community and watershed groups. The program is also initiating research on how it can increase use of the mass media beyond traditional use of the news media.

A number of the commitments address continued interaction and strengthening the relationship between the Bay Program and the formal educational system. A key commitment in this area calls for public schools, beginning with the class of 2005, to offer every student a meaningful Bay or stream outdoor experience before graduation from high school.

The strategies for achieving the formal education commitments will be coordinated by the Communication and Education Subcommittee's Education Workgroup. The Virginia Interagency Workgroup, as called for by CBP Education Directive 98.1, will develop the state-specific strategies for Virginia. This group is an expansion of the longstanding Virginia Resource Use Education Council. This council has been active in Virginia for years. It includes representatives from state agencies such as the Department of Conservation and Recreation, Department of Environmental Quality, Department of Game and Inland Fisheries, Department of Forestry and the Department of Education, conservation and educational nonprofit organizations and classroom teachers. As a result of the interest generated by these new commitments, they are looking to expand their membership to other nonprofits in the watershed.

Many of the outreach and educational commitments found in this subsection complement Governor Gilmore's campaign for lifelong environmental education and learning, Virginia Naturally 2000. For example, in conjunction with the Virginia Naturally 2000 initiative, several Virginia high schools in the Bay watershed will receive funding during 2000-01 to develop replicable model school programs. While many of the commitments listed can be handled by agencies within the existing budgets, new commitments such as developing an outdoor experience for every student in the watershed may call for new resources.

(5.2) Community Engagement

The overarching theme of the Community Engagement subsection is to actively seek out involvement by localities, community watershed organizations and individual citizens in the process of achieving the Chesapeake 2000 agreement objectives. It is rooted in the belief that those closest to the issue are best equipped to provide input pertaining to the solution. To this end, Virginia is committed to engaging local partners and stakeholders in the process. Through this commitment, voluntary local initiatives will be realized, resulting in individual, community and Bay-wide ownership of the collective solutions.

Virginia has adopted a watershed management approach to addressing water quality issues across the Commonwealth. This is evidenced by the many initiatives currently underway which support this approach. These include the Water Quality Improvement Act, Watershed Planning and Permitting Task force, Nonpoint Source Advisory Committee, active participation on the CBP Community Watershed Task Force, and much more. Virginia’s effort to engage local interests has been successfully underway for several years. As a result, we have seen a significant increase in cooperative involvement at the local level as well as an overall commitment by the local interests to resolve their water quality issues.

Local governments and nonprofit watershed conservation groups will also have critical lead roles to play in achieving these commitments. The support of the General Assembly will also be critical for the success of these community-based commitments.

Virginia’s Natural Resource agencies individually and collectively have made commitments to engage local interests to address and resolve local water quality issues. These efforts include targeted planning, technical assistance and financial assistance for localities, community watershed organizations and regional planning organizations.

Through the individual and collective efforts of Virginia's Natural Resource Agencies, the foundation to achieve the Community Engagement and Watershed objectives has been firmly laid. This is affirmed through the cooperative effort of these agencies, along with the Virginia Municipal League, theVirginia Association of Counties, the National Association of Counties and others in the sponsorship of Virginia's most comprehensive and farthest-reaching Watershed Management Conference to date. The conference is designed to assist localities, community watershed organizations and other local interests to obtain the information, tools and other capabilities to address watershed issues at a local level.

While great strides have been made by Virginia's agencies and conservation partners, more is needed to fully achieve the objectives set forth in the Community Engagement subsection. Localities and community watershed organizations, now more than ever, will need the developmental, financial and technical assistance necessary to engage in the process. Further, a strengthened data management infrastructure will be required to support the increased communication needs and data collection and dissemination efforts.

(5.3) Government By Example

This subsection of the Agreement addresses the role of the signatories in providing examples of good environmental stewardship in three areas.

The key commitment in this subsection states that processes will be put in place to ensure that the state's properties and those development and redevelopment projects funded with state funds will be consistent with all relevant goals, commitments and guidance of the Agreement. To some considerable extent, this commitment is already met through the two existing state environmental review processes; one for Virginia Department of Transportation projects and one for all other state property projects that pass the cost thresholds of $250,000 for renovations and $500,000 for new construction. Additional stewardship guidance consistent with the Agreement is provided by several state executive orders including those for pollution prevention, riparian forest buffers and conservation treatment of state-owned agricultural lands. The new Agreement will result in the creation of a number of multi-agency teams that will focus on the implementation of sets of commitments. One of the initial responsibilities of those teams will be to evaluate how well the state is meeting the Agreement commitments in terms of state properties and state funded development and redevelopment projects. Those combined evaluations will be reviewed as a set and recommendations will be made as appropriate.

The state is complying with the requirement of the Environmental Policy Act to go through a phased replacement process whereby 80% of new state vehicles are to be alternative fueled vehicles (AFVs). Since 1998 the state has been purchasing AFVs which are powered by both gasoline and natural gas. Significant problems exist, however, with the manufacture of those vehicles and the use of the natural gas alternative.

State agencies will be involved in developing a new CBP Executive Council directive to address stormwater management on state and federal lands. Currently state agencies must comply with existing stormwater and erosion and sediment control requirements as well as the more stringent requirements that apply to those lands lying within the jurisdiction of the state's Chesapeake Bay Preservation Act.

(5.4) Partnerships

This subsection addresses working with the non-signatory states of the Chesapeake Bay basin (Delaware, New York and West Virginia) to increase communication and cooperation between those states and the Chesapeake Bay Program and its signatory states on issues of mutual concern and to help establish links with community-based organizations in the Bay watershed portions of those states.

Relations with the non-signatory states have evolved through the years as the CBP has expanded and refined its goals and objectives. The participation of the non-signatory states is particularly critical to achieving and maintaining the nutrient reductions necessary for a healthy and productive natural system. Toward that end a special Water Quality Steering Committee has been established to provide management oversight for the process of integrating the cooperative and statutory nutrient reduction programs of the Chesapeake Bay and its tidal tributaries. That committee is composed of representatives from all six Bay watershed states (Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia) the District of Columbia, EPA Region III, EPA Region II, the Chesapeake Bay Commission, the Susquehanna River Basin Commission, and the Interstate Commission on the Potomac River Basin. The primary objective of the committee is to assist with implementation of the Chesapeake Bay Integration Process, detailed in Section III of Part One of this report.

The new Agreement lays out the basic steps in the process designed to accomplish the delisting of those waters. A Memorandum of Understanding, "Cooperative Efforts for the Protection of the Chesapeake Bay and Its Rivers," is under review by the Bay basin jurisdictions and EPA and is expected to be signed this year by the Governors, the Mayor, and the EPA Administrator. That MOU will ensure that cooperation on the basin-wide nutrient reduction effort will be treated as a high priority by all participants. Other opportunities for working with the non-signatory states will be identified and explored as the implementation of the numerous commitments evolves.

Promoting interaction with non-signatory state community-based organizations will be coordinated through the Communication and Education Subcommittee of the CBP.

PART THREE
ENVIRONMENTAL STATUS AND TRENDS INFORMATION

I. INTRODUCTION AND OVERVIEW

This section presents information about key ecological conditions in the tidal portions of the **Virginia Chesapeake Bay,** its major tributaries (i.e., **Potomac**, **Rappahannock**, **James**, and **York** Rivers), and the **VA Eastern Shore**. Water quality conditions discussed are directly affected by the nutrient and sediment reduction strategies. These water quality conditions are: nutrients (nitrogen and phosphorus), chlorophyll, water clarity, suspended solids, and dissolved oxygen concentrations. Also discussed are some living resources closely linked to water quality such as submerged aquatic vegetation (SAV), plankton communities, and benthic communities.

The **Virginia Chesapeake Bay** and its tidal tributaries continue to show many encouraging environmental trends indicating progress toward restoration to a balanced and healthy ecosystem. The Bay system however does remain degraded and some areas and ecological indicators show continuing degradation. Progress to date in reducing nutrient inputs has made demonstrable improvements and we expect that full realization of nutrient reduction goals along with appropriate fisheries management and toxicant controls will assure further improvement in the Bay's recovery. Findings from monitoring programs are highlighted below and discussed further in the sections that follow.

- Overall, in Virginia's portion of the Chesapeake Bay drainage area, point source phosphorus loads between 1985 and 1999 have been reduced by 59%, and nitrogen reduced by 24%.

- Phosphorus levels in water entering the Bay from the watershed are reflecting nutrient load reductions by showing improving trends in many areas. Within the tidal waters themselves, there are also many improving trends observed and no degrading trends.

- Nitrogen levels are showing very widespread improving trends. Water entering from the watershed has decreasing levels in most of the major tributaries. Most sections of the tidal rivers and the **Virginia Chesapeake Bay** also show improving conditions. There are no areas of degrading conditions for nitrogen.

- Levels of dissolved oxygen are indicating several improving conditions in parts of the tidal rivers. However, conditions for dissolved oxygen remain fair or poor in parts of the **Virginia Chesapeake Bay** and some of the river segments near the Bay. The **Corrotoman** River is the only area indicating degrading conditions for dissolved oxygen levels.

- Water clarity, a very important environmental parameter, is generally poor and degrading in many areas. This is closely related to high and increasing levels of suspended solids. Widespread degrading conditions in the **Virginia Chesapeake Bay** may be causing degradation of zooplankton populations and are a major impediment to restoration of SAV populations.

! Populations of Submerged Aquatic Vegetation (SAV) have shown considerable increases since 1984. Levels generally peaked several years ago and had been decreasing through 1998, possibly due to higher than normal riverflows over recent years that carried increased amounts of nutrients and water-clouding sediments. There was a slight resurgence of SAV coverage for 1999, probably due to the extended drought from early 1998 through fall 1999 and the resultant decreased inputs of sediments.

Water quality continues to be below minimum SAV habitat objectives in many portions of the tidal rivers. The most important objective (available light) and the closely related objective of suspended solids are not met in most tributary segments. Several tributary segments also do not meet objectives for nutrient levels. Water quality in the **Virginia Chesapeake Bay** meets the majority of SAV habitat objectives.

! Overall phytoplankton community composition is relatively healthy and stable. However, there are signs of the increasing presence of several bloom producers (e.g. blue green algae), and some toxin producers (e.g., toxic *Pfiesteria* complex) are present in relatively low levels. Chlorophyll levels are generally stable except for in the **Potomac** River, where degrading conditions are occurring.

! Zooplankton populations are generally healthy throughout the Virginia tributaries and **Virginia Chesapeake Bay** with the exception of toxics Ahot spots@ such as the **Elizabeth** River. However, there are some discouraging trends of degradation in the zooplankton community. These degrading trends do not appear to be related to changes in nutrient or chlorophyll *a* concentrations; however, there may be a link with reductions in water clarity or salinity levels. Degrading zooplankton trends may affect upper trophic levels and be related to recent declines in bay anchovy and menhaden, and a dramatic increase in non-Pfiesteria striped bass lesions.

! Populations of non-harvested benthic dwelling organisms are generally healthy throughout much of the tidal rivers and **Virginia Chesapeake Bay**. However, they continue to be adversely affected by low dissolved oxygen in some areas and unidentified factors in other areas.

II. TRIBUTARY BASIN NUTRIENT LOADS

Under the tributary strategy program, nutrient sources in Virginia have been making steady progress in their effort to reduce annual nitrogen and phosphorus loads entering the Bay tributaries. The significant reductions achieved to-date are the result of greater use of best management practices (BMPs) by farmers and foresters, enhanced nutrient removal at wastewater treatment plants, improved local erosion and sediment control programs, stormwater management, and many other initiatives.

A. Point Sources

Table 8 presents the annual nitrogen and phosphorus loads discharged from point sources within each of Virginia's Bay tributary basins. The table also shows the percent change in loads when compared to the 1985 baseline.

The overall percent reduction for point source phosphorus loads between 1985 and 1999 is 59%, and for nitrogen it is 24%. In comparison to the 1998 loadings, the phosphorus load was somewhat lower (279,130 lbs/yr less), while the nitrogen load was slightly higher (17, 390 lbs/yr more). Steady progress has been made in reducing point source phosphorus loads since the adoption of the phosphate detergent ban in 1988 and the installation of phosphorus control systems at all the major facilities discharging to the tidal portions of the Bay tributaries. Although nitrogen loads overall have slighly increased since the baseline year, significant reductions are expected as the biological nitrogen reduction systems now being installed come on-line over the next two years.

Appendix C contains the 1999 nutrient load information for the individual point source discharges tracked in Virginia's portion of the Chesapeake Bay watershed. The tables present load data for each significant point source discharger by river basin. The list of facilities is sorted by the percent reduction achieved, in order to show those dischargers who have achieved the highest level of reductions in each river basin at the top of the list.

Table 8. Virginia Point Source Nutrient Loads

River Basin	Number of Plants	1999 Phosphorus Load (lbs/yr)	Phosphorus % Change from 1985	1999 Nitrogen Load (lbs/yr)	Nitrogen % Change from 1985
Shen/Potomac	34	383,450	-43%	11,491,490	8%
Rappahannock	13	58,960	-68%	561,020	15%
York	8	217,310	-52%	1,728,440	25%
James	30	1,323,220	-63%	13,351,910	-44%
Coastal	8	157,930	-52%	1,710,530	31%
Totals =	**93**	**2,140,870**	**-59%**	**28,843,390**	**-24%**

B. NonPoint Sources

Table 9 presents the total annual nitrogen, phosphorus, and sediment loads from nonpoint sources from each of Virginia's Bay tributary basins. The table also shows the percent change in loads when compared to the 1985 baseline. These loading estimates are draft results based on the Year 2000 Progress run of Phase 4.3 of the Chesapeake Bay Watershed Model.

Table 9. Virginia Nonpoint Source Nutrient Loads

River Basin	2000 Phosphorus Load (lbs/yr)	Phosphorus % Reduction from 1985	2000 Nitrogen Load (lbs/yr)	Nitrogen % Reduction from 1985	2000 SedimentLoad (tons/yr)	Sediment % Reduction from 1985
Shen/Potomac	1,660,000	10.1%	13,970,000	9.5%	720,000	14.8%
Rappahannock	880,000	18.6%	7,520,000	18.8%	330,000	21.2%
York	660,000	12.5%	6,890,000	12.1%	140,000	12.5%
James	4,500,000	1.1%	22,810,000	2.3%	1,200,000	7.5%
Coastal	200,000	9.7%	2,120,000	2.4%	20,000	0%

WATER QUALITY

Monitoring of water quality conditions is vital to understanding environmental problems, developing strategies for managing the Bay's resources, and assessing progress of management practices. This section summarizes results of statistical analyses conducted on surface measurements of total nitrogen, total phosphorus, chlorophyll *a*, water clarity, total suspended solids and bottom measurements of dissolved oxygen. These parameters are measures of water quality that are directly effected by nutrient loading changes and in turn directly affect living resources.

Phosphorus: Nutrients such as nitrogen and phosphorus influence the growth of phytoplankton in the water column. Elevated concentrations of these nutrients can result in excessive phytoplankton production (i.e., algal growth rate). Decomposition of the resulting organic material by bacteria during the summer can result in low levels of dissolved oxygen in bottom waters. Low oxygen levels (anoxic or hypoxic events) can cause fish kills and drastic declines in benthic communities which are the food base for fish populations. Anoxic waters also adversely affect fish and crab population levels by limiting the area available for these organisms to live in.

Figure 1 presents the current status and long term trends (1985-1999) in phosphorus concentrations. Areas of the **Elizabeth** River have the poorest conditions in relation to the rest of the Chesapeake Bay system. Many segments are ranked as good except for the lower **James**, **York**, and much of the tidal **Potomac**, where conditions are fair. The Ariver input@ stations shown in figure 1 provide information about the success of efforts to control nutrients entering the tidal Bay system. Results shown at these river input stations are flow adjusted to remove the effects of riverflow and therefore assess only the effect of nutrient source reductions. The watershed input stations on several major rivers (**Rappahannock**, **James, and Mattaponi**) all show improving trends (i.e., decreasing concentrations of phosphorus when the effect of riverflow is removed). These improving trends are probably a result of the Phosphate detergent ban as well as best management practices for the control of non-point nutrient runoff. Only the **Pamunkey** indicates a degrading trend, suggesting phosphorus controls have not

The terms good, fair, and poor used in conjunction with water quality conditions (except Dissolved Oxygen) are statistically determined classifications for comparison among areas of similar salinity within the Chesapeake Bay system. Though useful in comparing current conditions among different areas of the Chesapeake Bay system, it must be remembered that these terms (good, fair, poor) are not absolute evaluations but only evaluations relative to other areas of a generally degraded system. Several major scientific studies have shown that the Chesapeake Bay system is currently nutrient enriched and has excessive and detrimental levels of nutrient and sediment pollution. Given this, it is likely that an absolute evaluation in relation to ideal conditions would indicate that most water quality parameters are currently poor throughout the whole Bay system.

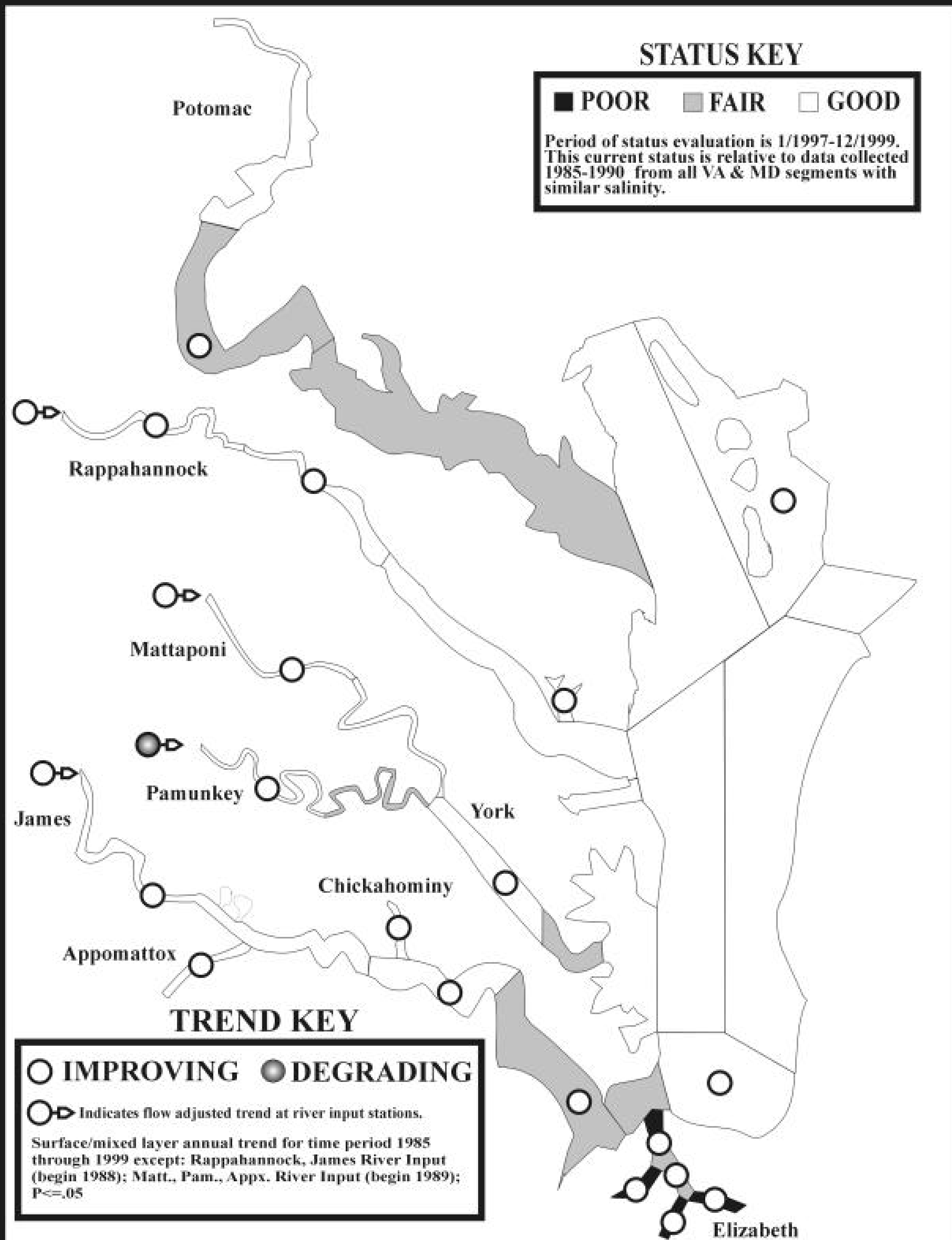
A direct comparison of status categories should not be made between this report and previous annual reports because errors have been found in classification calculations used in previous reports. These errors skewed classifications toward being more degraded than they should have been. For example: segments that should have been designated as “good” may have been incorrectly designated only “fair” or even “poor”.

The Monitoring Subcommittee of the Federal-Interstate Chesapeake Bay Program continues to develop additional methodologies for water quality status evaluations which in the future will be used in conjunction with, or possibly in replace of, the current methods.

been as effective in this basin.

These decreasing phosphorus concentrations in the riverflow entering from the watershed have had widespread positive impacts on phosphorus concentrations in the tidal waters. Previous analyses of trends since 1985 found phosphorus concentrations increasing in many areas. The current analyses indicate that these degrading trends have been reversed and there are widespread improving conditions for phosphorus.

Figure 1) Total Phosphorus Status and Trends



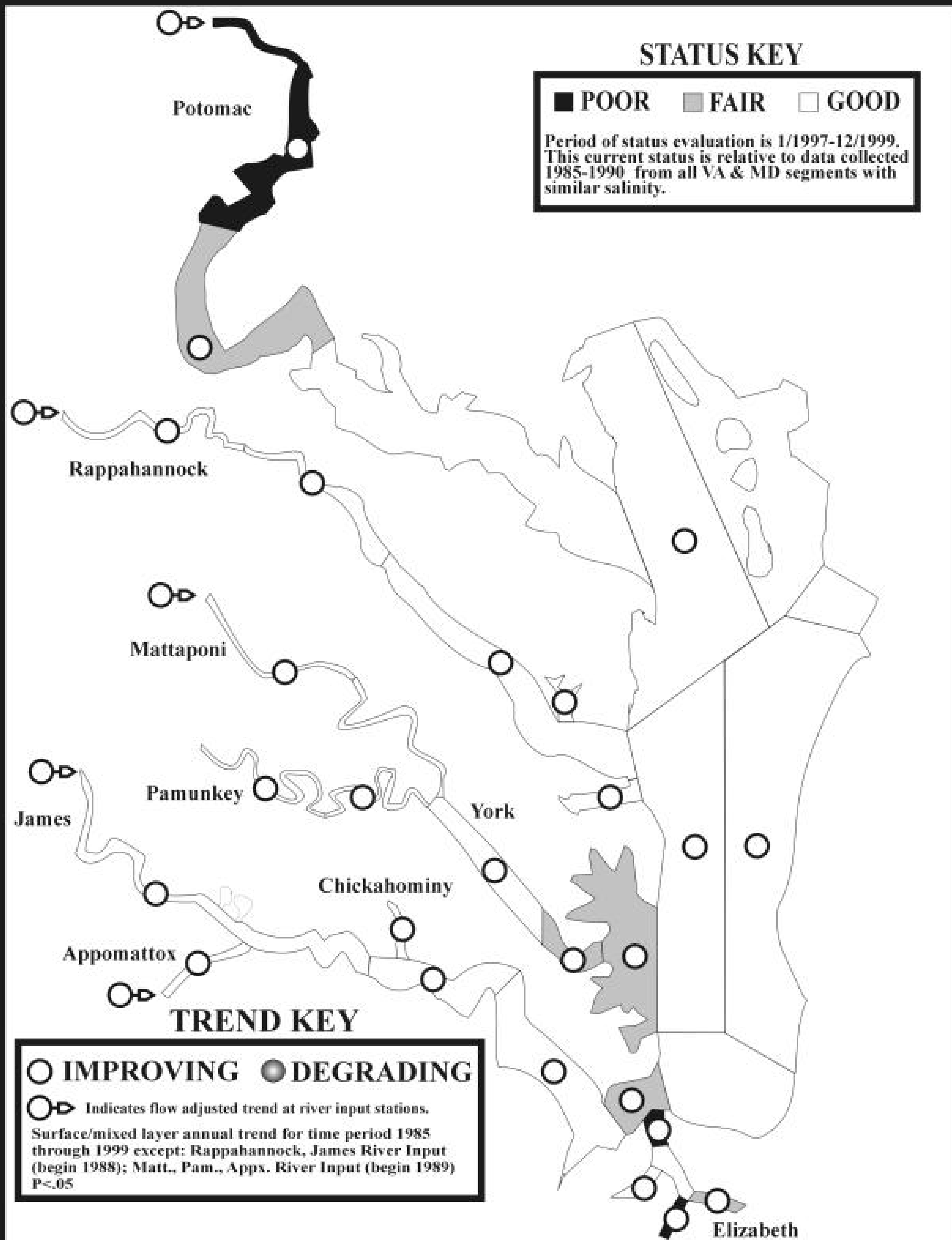
Nitrogen: Figure 2 presents the status and long term trends (1985-1999) in nitrogen concentrations. Current status in the upper **Potomac** River and parts of the **Elizabeth** are worse than those found in the major southerly tributaries (**Rappahannock**, **York**, and **James**) or the **Virginia Chesapeake Bay**. As with phosphorus, management actions to reduce nitrogen have been effective as indicated by improving conditions at nearly every river input station. These management actions also have created very widespread improving trends throughout the tidal waters.

Chlorophyll: Chlorophyll *a* is a measure of the level of algal (i.e., phytoplankton) biomass in the water. In general, high chlorophyll *a* or algal levels are considered to be an indicator of deteriorating water quality. High algae levels can lead to low dissolved oxygen conditions when the material sinks into bottom waters and is decomposed. High algal levels can also be a factor in reduced water clarity and reducing the amount of light that reaches Submerged Aquatic Vegetation (SAV).

Figure 3 presents the current status and long term trends (1985-1999) in chlorophyll concentrations. Parts of all major tributaries **(Potomac, Rappahannock, York, and James**) have a poor status. Remaining areas are about equally divided between fair and good status. Degrading trends in chlorophyll are occurring throughout the **Potomac** River and in **Tangier Sound**. The only improving trends are occurring in the **Chickahominy** and western branch **Elizabeth** rivers. The relative lack of improving chlorophyll levels despite the improving nutrient conditions possibly means that nutrient levels are still too high and further reductions will be necessary before overall chlorophyll levels are effected.

Dissolved Oxygen: Dissolved oxygen is an important factor affecting the survival, distribution, and productivity of living resources in the aquatic environment. Figure 4 presents the current status and long term trends (1985-1999) in dissolved oxygen concentrations. Status of each segment is given in relation to the dissolved oxygen levels supportive of living resources. The lower **Potomac**, lower **Rappahannock**, and lower **York**, as well as some **Virginia Chesapeake Bay** segments are indicated as poor or fair because of low dissolved oxygen in the bottom waters of mid-channel trenches. These mid-channel trenches naturally have lower dissolved oxygen levels and the spatial and temporal extent of low levels has been exacerbated by nutrient impacts. As in previous years, there continues to be improving conditions in segments of the Rappahannock, **James**, and **Elizabeth**. There are improving trends in the **Mobjack** Bay and upper **Potomac** River that were not detected in the time period of data analysis performed for the previous annual report (i.e., 1985-1998)

Figure 2) Total Nitrogen Status and Trends



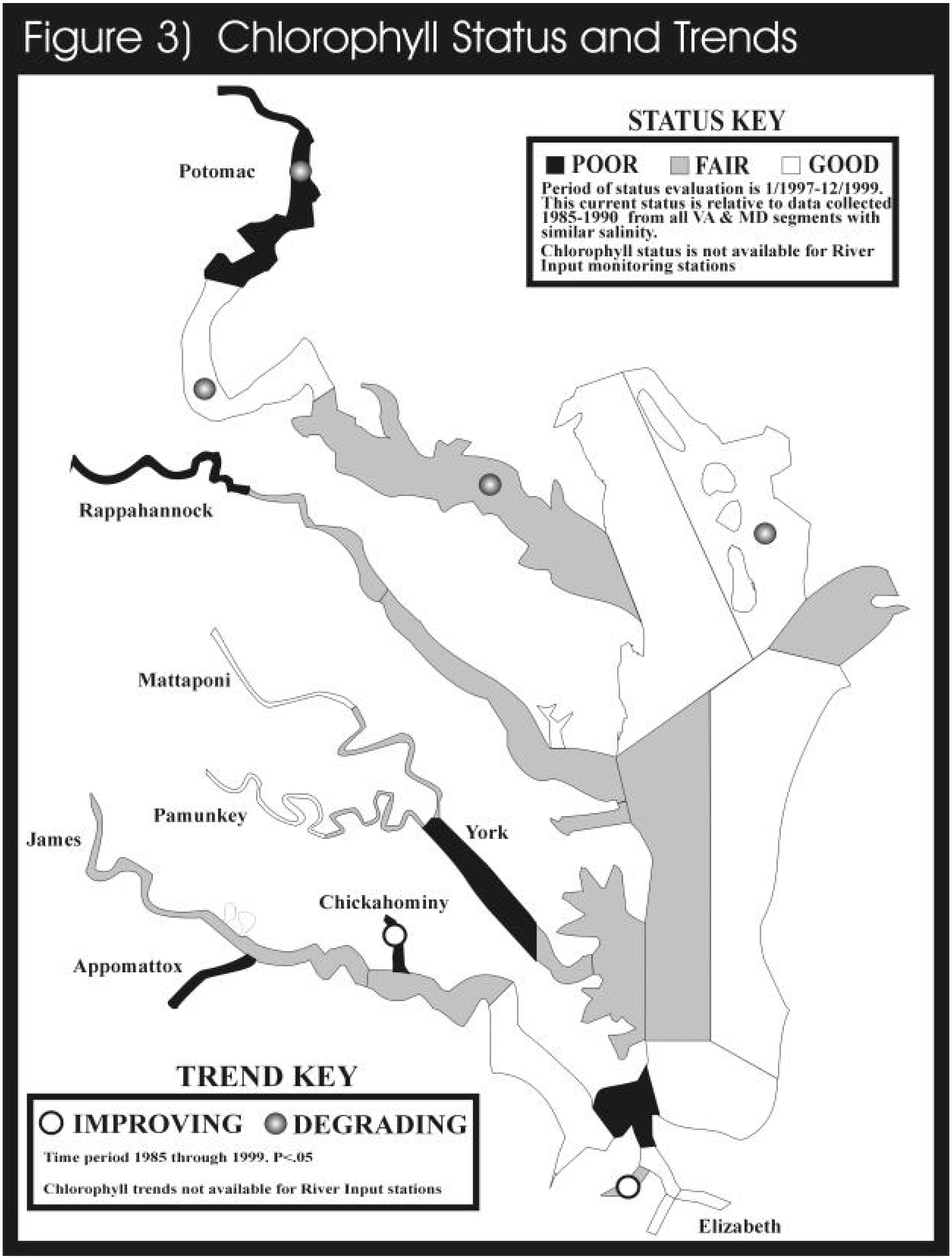


Figure 3) Chlorophyll Status and Trends
STATUS KEY
POOR FAIR GOOD
Period of status evaluation is 1/1997-12/1999.
This current status is relative to data collected 1985-1990 from all VA & MD segments with similar salinity.
Chlorophyll status is not available for River Input monitoring stations
Potomac
Rappahannock
Mattaponi
Pamunkey
James
York
Chickahominy
Appomattox
Elizabeth
TREND KEY
IMPROVING DEGRADING
Time period 1985 through 1999. P<.05
Chlorophyll trends not available for River Input stations

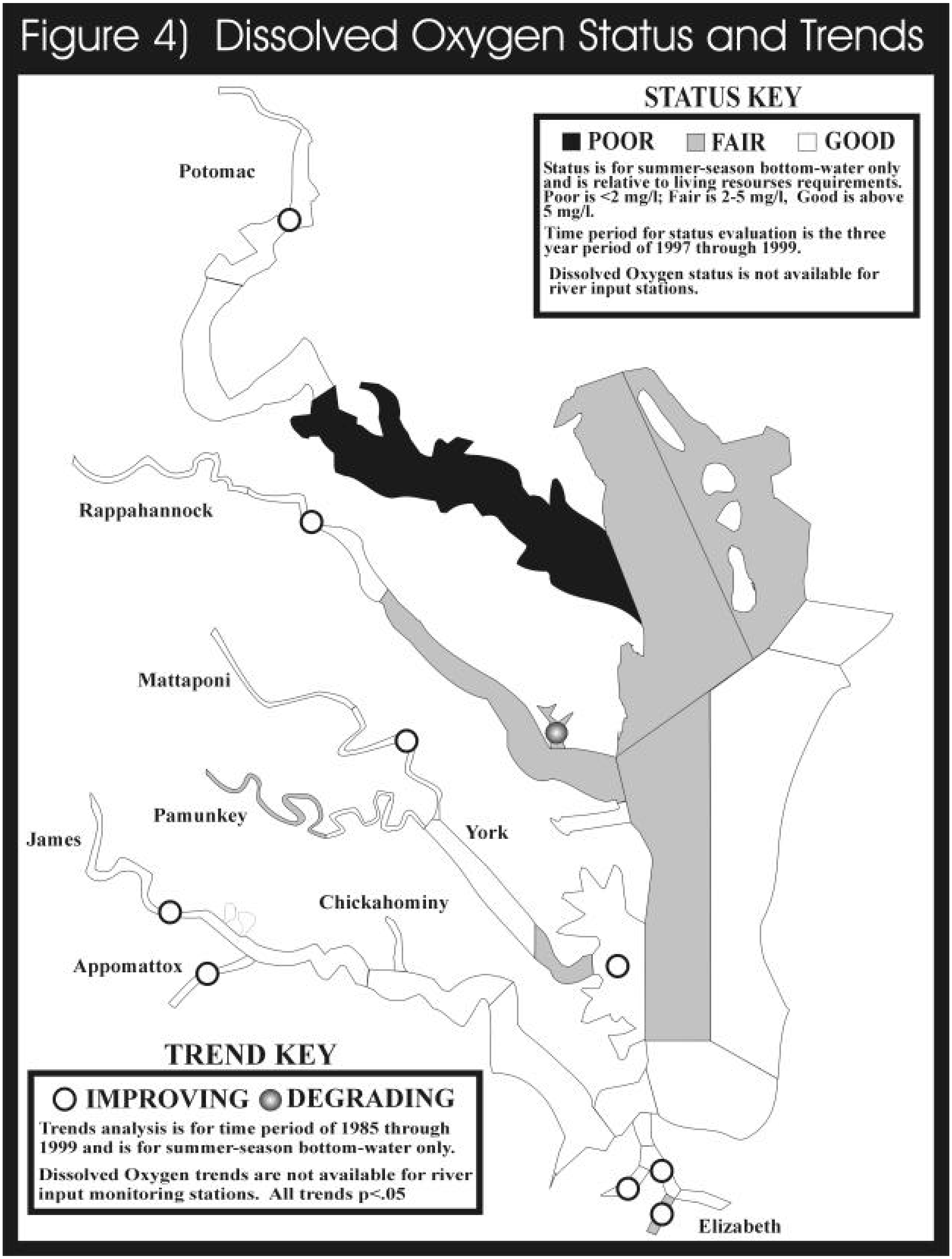


Figure 4) Dissolved Oxygen Status and Trends
STATUS KEY
POOR
FAIR
GOOD
Status is for summer-season bottom-water only and is relative to living resourses requirements. Poor is <2 mg/l; Fair is 2-5 mg/l, Good is above 5 mg/l.
Time period for status evaluation is the three year period of 1997 through 1999.
Dissolved Oxygen status is not available for river input stations.
Potomac
Rappahannock
Mattaponi
Pamunkey
York
James
Chickahominy
Appomattox
Elizabeth
TREND KEY
IMPROVING
DEGRADING
Trends analysis is for time period of 1985 through 1999 and is for summer-season bottom-water only.
Dissolved Oxygen trends are not available for river input monitoring stations. All trends p<.05

Water Clarity: Water clarity is a measure of the ability of sunlight to penetrate through the water. Poor or decreasing water clarity is an indication that conditions are inadequate for the growth and maintenance of submerged aquatic vegetation (SAV). Poor water clarity can also affect the health and distributions of fish populations by changing their ability so see prey or avoid predators. The major influences on water clarity are: 1) concentrations of particulate inorganic mineral materials (e.g., sand or clays), 2) concentrations of planktonic algae (i.e., phytoplankton), 3) concentrations of particulate detrital organic material (e.g., very small particles of dead algae or decaying marsh grasses), and 4) dissolved substances which ›color= the water (e.g., brown humic acids generated by plant decay). Which of these factors is dominant can vary seasonally and spatially.

Figure 5 presents the current status and long term trends (1985-1999) in water clarity. Poor water clarity is one of the major environmental indicators of degradation in the Chesapeake Bay system and is a major factor hindering the resurgence of submerged aquatic plant growth because current status is only poor or fair in most segments. There are also widespread areas where further degradation of water clarity is occurring, especially in the lower tributaries and **Virginia Chesapeake Bay**. One of the reasons for these degrading trends is possibly the high level of riverflow in several recent years. Other possible reasons are increased shoreline erosion in the tidal waters.

Suspended Solids: Suspended solids are a measure of the small particulates in the water, a combination of items 1-3 listed in the above discussion of water clarity. Suspended solids directly affect water clarity and are most often the major controlling factor. Elevated suspended solids can also be detrimental to the survival of oysters and other aquatic animals. Oysters can be smothered by deposition of the material and the feeding success of filter feeding fish (e.g., menhaden) can be negatively effected. In addition, since suspended solids can contain organic and mineral components containing nitrogen and phosphorus, increases in suspended solids can result in an increase of nutrients.

Figure 6 presents the current status and long term trends (1985-1999) in suspended solids concentration. Parts of all major tributaries (**Potomac**, **Rappahannock**, **York**, **James**, **and Elizabeth**) have poor levels. The improving trends in flow adjusted concentration at the River Input stations of the **Potomac** and **Rappahannock** are encouraging signs that management actions to reduce NPS sediment runoff may be having some success. However, there are several degrading trends in the tributaries and some of the **Virginia Chesapeake Bay** mainstem. As with water clarity, reason for these degrading trends are possibly high levels of riverflow, or tidal shoreline erosion.

Figure 5) Water Clarity Status and Trends

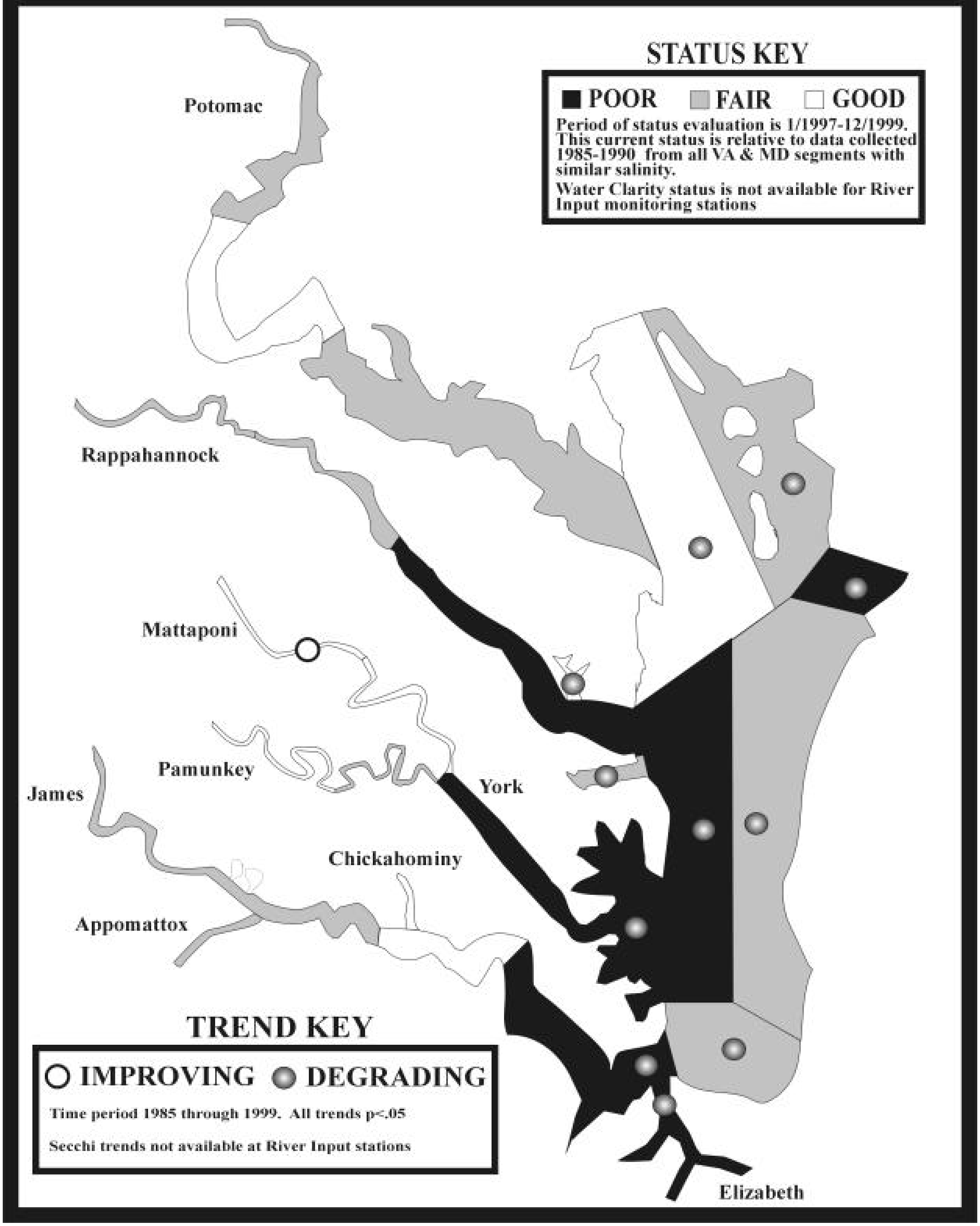
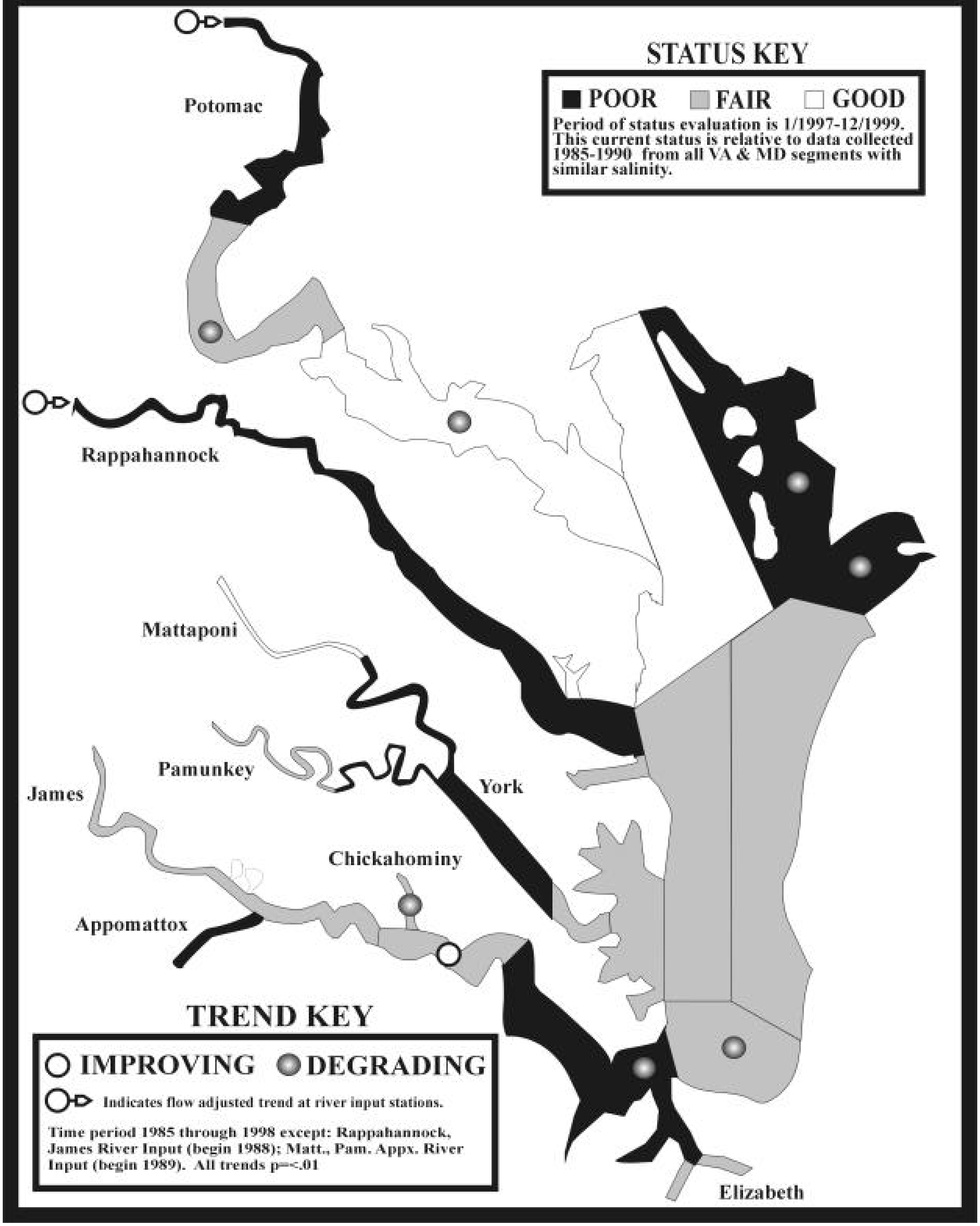


Figure 6) Suspended Solids Status and Trends



Water Quality on the Eastern Shore

The bayside inlets and creeks on Virginia's Eastern Shore are relatively shallow and tidally well mixed with Bay water. Small tidal creek systems are associated with many of the principal inlets and creeks. Relatively little water quality data exists for the tidal waters of the Eastern Shore in comparison to the major western shore tidal waters (e.g. Potomac, James, York, Rappahannock rivers).

There was a one-year study of six tidal creeks (three Abayside@ and three Aseaside@) in Northampton County in 1991 (A Study of Water Quality Conditions in Tidal creeks of Northampton County, Lagera, 1992). Among the problems noted were low dissolved oxygen (DO) conditions detrimental to marine life and increased nutrient levels after rainfall events that were associated with active farmland. This study concluded that generally good water quality was present but noted A . . . there may be incipient water quality problems that are developing. The parameters that are of concern are DO, turbidity and nitrate.@

There has been sporadic monitoring of water quality parameters in Hungars creek since June 1991 by the University of Virginia (Dr. Linda Blum, 9/1/98 personal written communication). This study has found that total dissolved inorganic nitrogen (DIN) levels in Hungars Creek are low relative to western shore Chesapeake Bay tidal creeks. Chlorophyll concentrations are sometimes high but generally lower relative to western Bay-shore tidal creeks and with relatively low levels of phytoplankton productivity. The overall conclusion is that water quality is good for Hungars Creek in comparison with areas subject to greater degrees of cultural eutrophication such as those on the more highly developed and populous western shore of the Bay.

A one year study was conducted by the Virginia Institute of Marine Science in which water quality data was collected from Hungars and Cherrystone creeks in 1997 (Data Report, Final Report for Task 84 FY95). The data were analyzed with respect to the SAV habitat objectives. Essentially no observations of nutrient concentrations for dissolved inorganic nitrogen or dissolved inorganic phosphorus violated SAV habitat objectives during their growing seasons. Most of the data violated the algae concentration habitat objective were collected in late winter and early spring (February and April), the latter being a critical period for SAV growth. The spatial distributions showed either no pattern or decreasing concentrations from the creek mouth up into the creeks. This suggests that the winter-spring algal bloom originates from the Bay. There were only a few observations of algae concentrations exceeding the requirement during the summer months (June and August). A major finding of environmental degradation is that total suspended solids concentrations exceeded the SAV habitat requirement in both basins in all seasons. Total suspended solids showed either no spatial pattern or a pattern of increasing concentrations up into the creeks from the creek mouth. This suggests that local watershed runoff contributes to the excess solids concentrations. Dissolved oxygen concentrations below 5.0 mg/l were not detected during this study.

The Virginia Department of Environmental Quality (DEQ) collected water quality samples at 23 stations on 17 different streams the Eastern Shore during between July 1998 and December 1999 as part of its long term ambient monitoring program and special studies. These data show a few instances of low DO which are below the State water quality standard (4.0 mg/l) in North Branch and Holdens Creek and also show some relatively high nutrient concentrations. Stations in the Pocomoke River and Pungoteague creek show some exceedances of SAV habitat criteria though there is insufficient data to fully assess these. Three of these long term monitoring stations (Parker Creek, Holdens Creek, Parting Creek) showed increasing phosphorus and nitrogen nutrient concentrations (Long Term water Quality Trends in Virginia's Waterways, VWRRC Special report No. SR11-1998, December 1998).

The Alliance for Chesapeake Bay coordinates volunteer water quality monitoring at 4 stations on the Eastern Shore. Two stations in the Chesconessex creek system (near Pocomoke Sound) were monitored for SAV habitat water quality parameters during 1999. Results found that all the SAV habitat criteria are met except for that for suspended sediment. This indicates that water clarity is probably detrimental to the SAV communities in this creek. A station at the mouth of Nassawadox creek indicates good conditions for dissolved oxygen but also less than ideal water clarity for SAV. A station on Pungoteague creek indicates good dissolved oxygen conditions as well as good water clarity.

IV. SUBMERGED AQUATIC VEGETATION

Submerged aquatic vegetation (SAV) refers to underwater vascular plants such as eel grass and widgeon grass. These aquatic plants perform a number of valuable ecological roles in Chesapeake Bay. They are food for waterfowl and also provide habitat for a variety of fish, shellfish and many smaller organisms. The beds of SAV are also a nursery area for juvenile stages of many valued commercial and recreational fishes. Historically, SAV has generally been abundant throughout Chesapeake Bay; however, current populations are only a remnant of the once thick beds that provided shelter to the Bay's thriving fisheries. The drastic decline of SAV, first noted in the 1970's, sparked the interests of Bay scientists and managers to determine the cause for this significant loss and seek methods to restore this dwindling resource.

SAV status and trends: In order to provide a stepwise measure of progress, the Chesapeake Bay Program established a tiered set of SAV distribution restoration targets. Each tier represents expansions in SAV distribution that are anticipated in response to improvements in water quality. **Tier I** describes SAV restoration to areas currently or previously inhabited by SAV as mapped through regional and baywide aerial surveys from 1971 through 1990. **Tier II** is restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the one-meter depth contour. **Tier III** is restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the two-meter depth contour.

The current amounts of SAV for each section of the **Potomac** are shown in Figure 7 in relation to Tier 1 goals (*note: SAV areas are not available for 1988*). The SAV amount in the lowermost section has steadily increased over the last 15 years and has exceeded the tier I goal since 1997. While this is very positive, it should be noted that the goal for this section is relatively small (400 Hectares) while the middle and upper portions of the river have much higher area goals. Populations of SAV in the in the upper and middle section of the river peaked in the early 90s, then declined for several years until increasing by a relatively large amount in 1998.

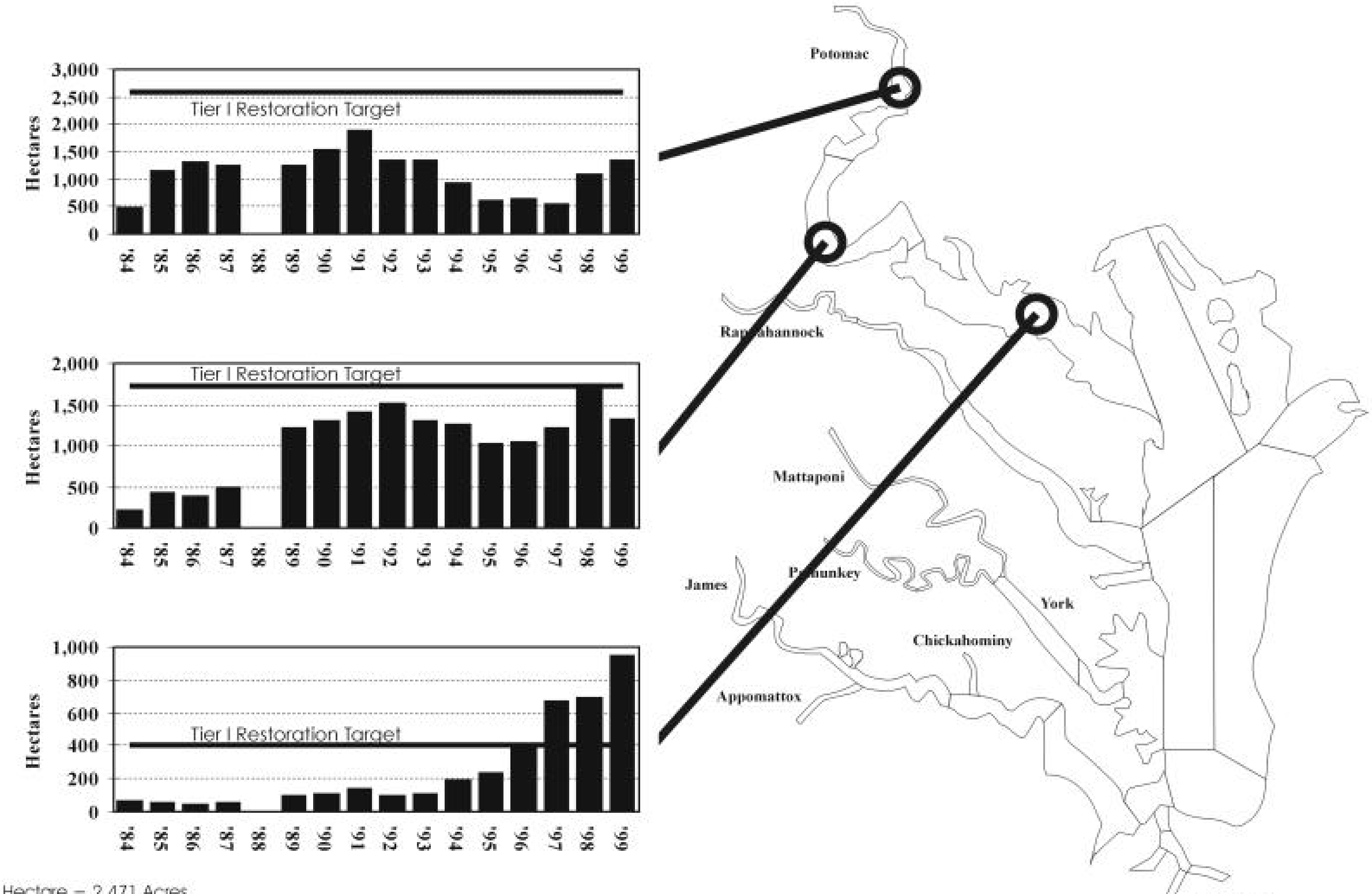
Figure 8 shows the SAV goal attainment, distribution, and past 15-year trends for the lower **Rappahannock** River area. The lower **Rappahannock** River once had relatively large amounts of SAV but now has only 3% of its goal of 1000 hectares. In 1990, the **Corrotoman** River was close to its relatively small goal of 218 hectares but had steady decline through 1998 until increasing again in 1999. The **Piankatank** River had increasing SAV through 1993 but has declined since then.

Figure 9 shows the SAV goal attainment for the lower **York** area. The **Mobjack Bay** contains the most widespread areas of SAV in Virginia tributaries. In 1999 there were 3,584 hectares of SAV here. Populations of SAV increased from 1984 through 1992 but generally leveled off since then and declined during the last two years. The lower two **York** segments have relatively low goals (566 hectares and 22 hectares respectively) and SAV goal attainment equivalent to 47% and 0% respectively. In 1984, there were 34 hectares of SAV found in the upper **Mattaponi** and 76 hectares found in the upper **Pamunkey**. This was the first year that these Rivers were surveyed so they do not have a tier 1 goal and are not shown on figure 9. Quantitative data for these segments in 1999 is not available due to poor atmospheric conditions resulting from hurricanes Dennis and Floyd and an early, possibly salinity-related, die-off in freshwater SAV species. However, ground surveys by VIMS personnel in 1999 did show SAV in the same locations as found in 1998.

Figure 10 shows the SAV goal attainment for the **James** River area. There has been very low historical SAV levels documented here. Although several segments have exceeded tier I goals, this is not very significant because the goals for the segments shown are small (only 16 and 91 hectares). The **Chickahominy** had 205 hectares in 1998 but declined to 37 hectares in 1999. There were 6 hectares found in the middle **James** and 36 hectares found in the upper **James** when they were surveyed for the first time in 1998. These segments are not shown on figure 10 and do not have tier 1 goals because of the very low levels found in early studies. Quantitative data for these segments in 1999 is not available due to poor atmospheric conditions resulting from hurricanes Dennis and Floyd and an early, possibly salinity-related, die-off in freshwater SAV species.

Figure 11 shows SAV distributions in the **Virginia Chesapeake Bay** segments. The wide expanses of shallows around the **Tangier** sound complex have the highest amounts of SAV in the entire Chesapeake Bay. The SAV distribution goal here is 8,000 hectares and there were 7,330 hectares here in 1992. A major concern has been the steady decline in SAV here since 1992 to a level of only 2,676 hectares in 1998, rebounding slightly to 4,299 hectares in 1999. Most other **Virginia Chesapeake Bay** segments also had a peak in SAV coverage in 1992-93 and have declined since then. These widespread and large declines of SAV in the Virginia Chesapeake Bay are of significant environmental concern because of the ecological value of these habitats. These recent declines may be due to the high riverflows experienced in the last several years. High riverflows bring suspended solids that cloud the water, reducing water clarity and blocking sunlight from reaching the plants. As indicated previously, most **Virginia Chesapeake Bay** segments have had degrading trends in water clarity since 1985, associated with some increases in suspended solids. Light can also be blocked from reaching the SAV by the growth of epiphytic organisms on the leaf surface or planktonic algae in the water, both of which are stimulated by high nutrient levels.

Figure 7) Potomac River SAV Distribution



1 Hectare = 2.471 Acres
No data available for 1988

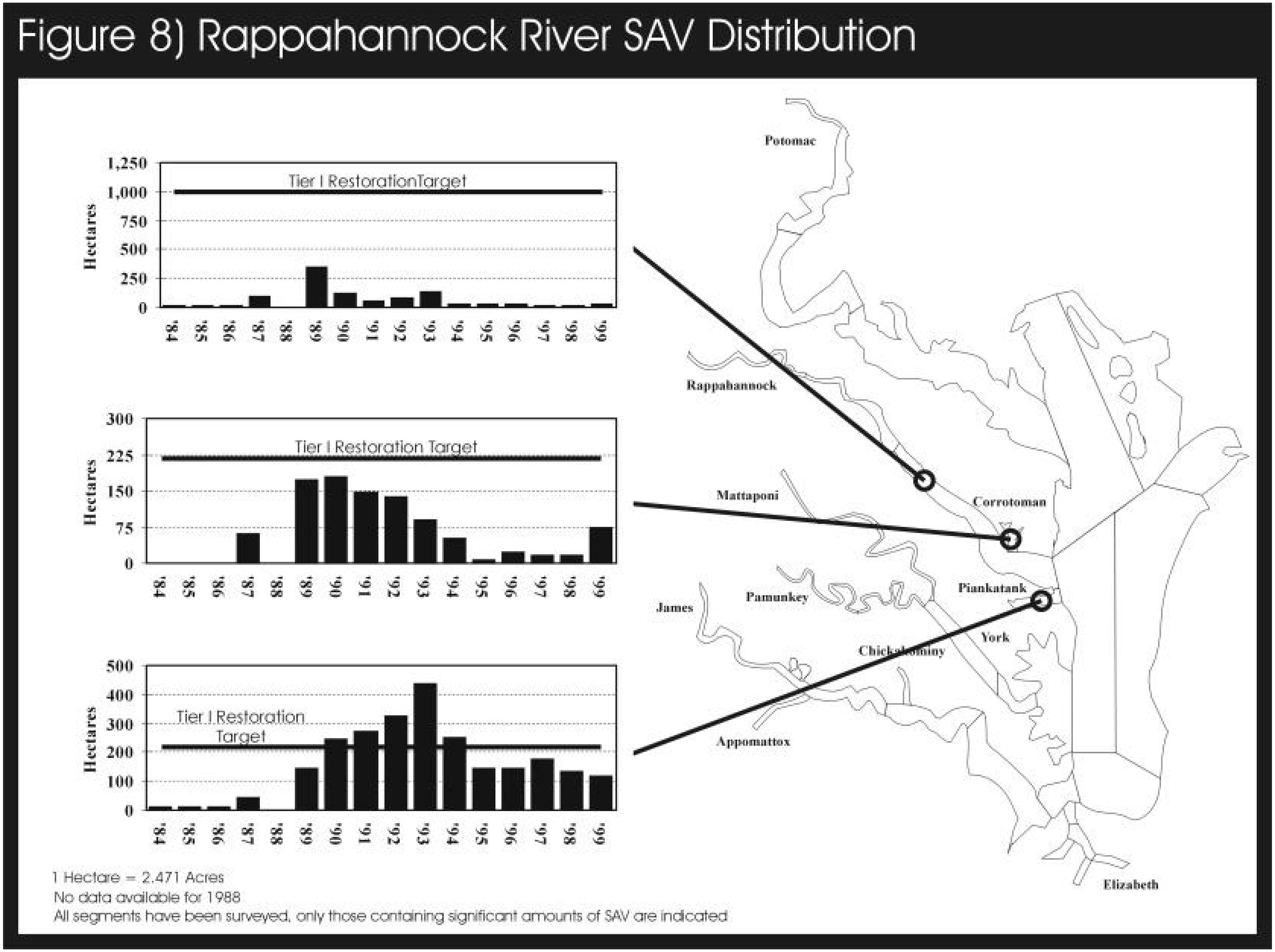
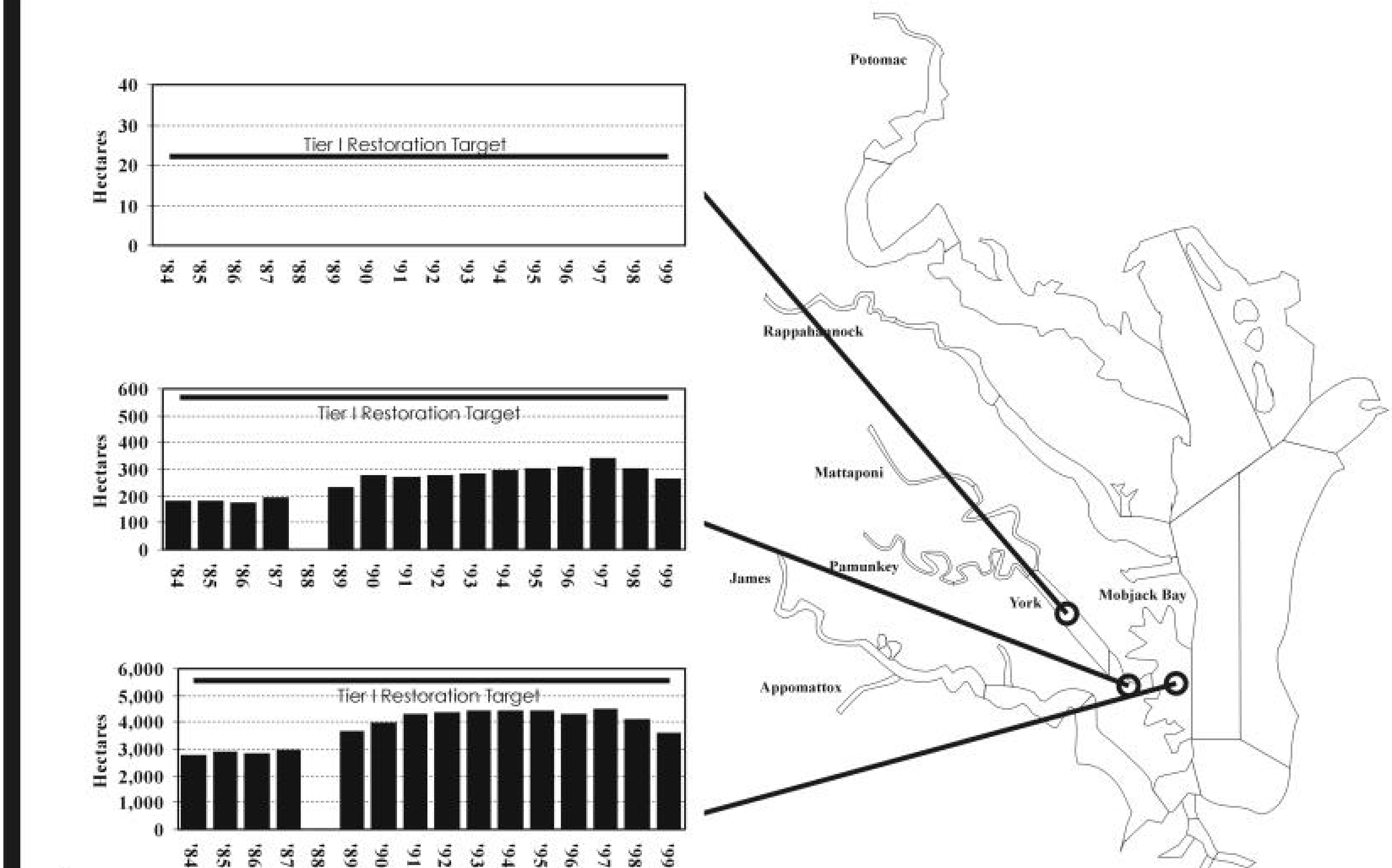


Figure 8) Rappahannock River SAV Distribution
Tier I RestorationTarget
Tier I Restoration Target
Tier I Restoration Target
Hectares
1,250
1,000
750
500
250
300
225
150
75
400
200
100
0
'84 '85 '86 '87 '88 '89 '90 '91 '92 '93 '94 '95 '96 '97 '98 '99
Potomac
Rappahannock
Mattaponi
Corrotoman
Pamunkey
Piankatank
James
York
Chickahominy
Appomattox
Elizabeth
1 Hectare = 2.471 Acres
No data available for 1988
All segments have been surveyed, only those containing significant amounts of SAV are indicated

Figure 9) York River SAV Distribution

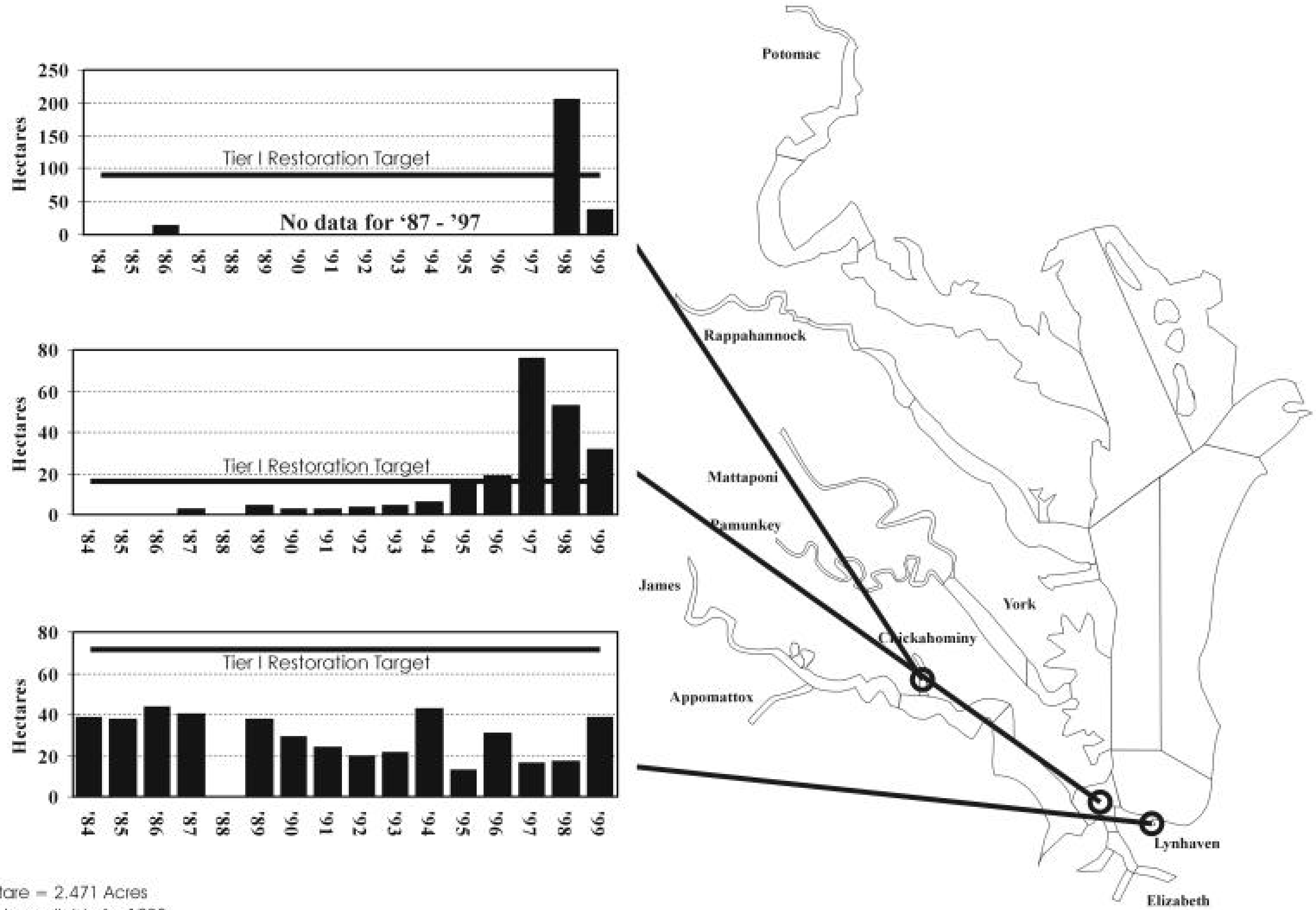


1

No data available for 1988

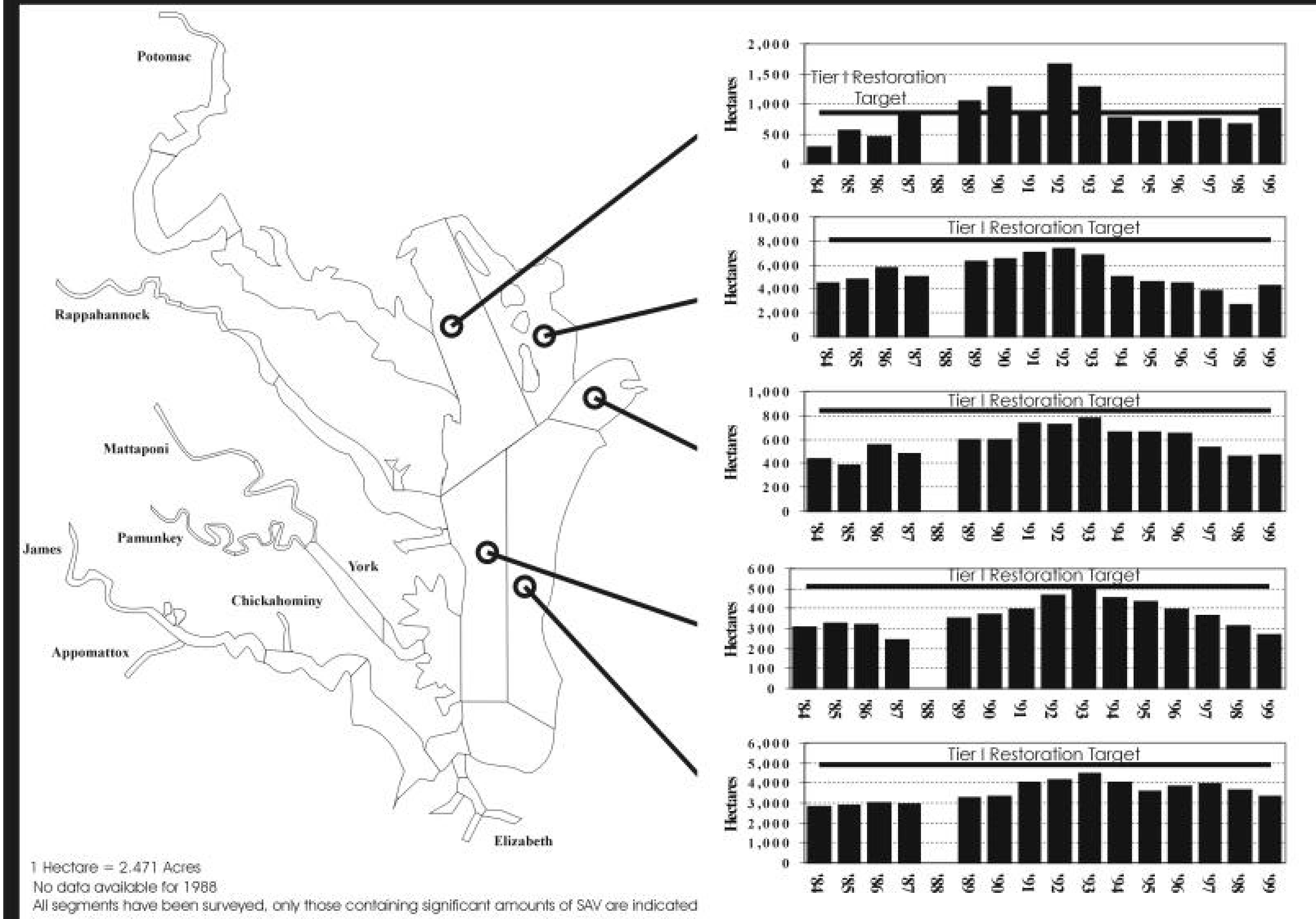
All segments have been surveyed, only those containing significant amounts of SAV are indicated

Figure 10) James\Lynhaven River SAV Distribution



1 Hectare = 2.471 Acres
No data available for 1988
All segments have been surveyed, only those containing significant amounts of SAV are indicated

Figure 11) Bay Mainstem SAV Distribution



SAV habitat objectives: Water quality conditions most influential in SAV growth are those that directly measure or contribute to light conditions, including: dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP), total suspended solids (TSS), chlorophyll *a,* Secchi depth, and available light (pll). While light is the major parameter controlling SAV distribution, nutrients such as nitrogen and phosphorus indirectly contribute to light attenuation by stimulating growth of algae in the water column and on the leaves of SAV. Chlorophyll *a* is a measure of the amount of algal phytoplankton that contributes to decreased water clarity. Available light is a direct measure of water clarity and is described in terms of "percent light at leaf". Together, these parameters provide for both qualitative and quantitative measures of the available light to the SAV community. The Chesapeake Bay Program has developed a set of SAV habitat objectives for these water quality parameters (Table 10). These habitat objectives identify minimum levels of water quality conditions that should be met in order for SAV growth to occur. The diversity of SAV communities coupled with their wide salinity ranges has led to the establishment of separate objectives based on salinity.

Table 10. SAV Habitat Requirements

Water Quality Parameter	Value	Other Specifications
Available Light [4] (pll)	>9% >15%	For TF[1,2] and OL[1,2] regions For ME[1,2] and PO[1,3]
Total Suspended Solids (mg/l)	<15	For TF[2], OL[2] & ME[2] regions and PO[3]
Chlorophyll *a* (ug/l)	<15	For TF[2], OL[2] & ME[2] regions and PO[3]
Dissolved Inorganic Nitrogen (mg/l)	<0.15	For ME[2] regions and PO[3]
Dissolved Inorganic Phosphorus (mg/l)	<0.02 <0.01	For TF[2] & OL[2] and PO[3] For ME[2] and PO[3]

1 TF=Tidal Fresh (<0.5 ppt salinity), OL=Oligohaline (0.5 to 5.0 ppt salinity),ME=Mesohaline (5.0 to 18.0 ppt salinity) and PO=Polyhaline (>18 ppt salinity)

2 Critical Life Period for SAV is April through October in TF and OL habitat

3 Critical Life Period for SAV is March through November in PO habitat

4 Available Light should be applied as the primary habitat requirement; the remaining habitat requirements should be applied to help explain regional or site specific causes of water column and leaf surface light attenuation which can be directly managed. Attainment is assessed with measurements of Percent Light at Leaf or PLL. This requires Kd or Secchi depth, and surface measurements of DIN, DIP, and TSS.

Figure 12 shows current tributary water quality conditions in relation to all the SAV habitat objectives. Unfortunately, all tributary segments fail or are borderline for the available light objective except in the **Corrotoman** and lower **Potomac** which meet the objective (note that the available light objective here is assessed at a 1 meter depth, i.e. that depth required to support the tier II SAV goals). In general, the segments closest to the bay are borderline (i.e. lower **Potomac**, lower **York**, lower **James**) while those further upriver fail the light objective. The overriding importance of meeting the habitat criteria for light is particularly evident in the lower **Rappahannock** area where all criteria are met except the light criteria and this region has had particularly large decreases in the amount of SAV present and little resurgence. This is in contrast to the lower **Potomac** River segment where the light objective is met and there has been a fairly large resurgence of SAV.

The **Rappahannock** overall seems to be the best tributary in relation to SAV related water quality, meeting about 56% of its applied objectives. The **York** and **Elizabeth** River are worst, meeting only 23% and 16% respectively of the applied SAV habitat objectives. The **James** River is a little better, meeting 38% of the objectives.

This presentation gives only a very general geographic overview of water quality problems as they relate to SAV. In considering management strategies, geographically specific considerations need to be taken into account. For example, while most segments near the river mouths may meet the available light objective, many near-shore areas of these segments may not meet the light objective due to near-shore sediment resuspension from wind or wave action. Also, though the upper **James** meets the phytoplankton objective (i.e. chlorophyll) when averaged over the whole segment, there are localized high chlorophyll levels in the Hopewell area where the objective is not met.

Light availability is the primary SAV habitat objective and the other habitat objectives are used to explain regional or site specific causes for the degraded light availability. The primary causes of light degradation are suspended solids, phytoplankton, and fouling organisms on the SAV leaf surfaces. The nutrient objectives are important because they stimulate the growth of both phytoplankton and the fouling organisms. Many segments meet the phytoplankton objective but fail the objective for suspended solids. This suggests that light availability has been degraded from such things as non-point sediment runoff, shoreline erosion, bottom sediment resuspension, or naturally occurring turbidity as opposed to nutrient stimulation of phytoplankton blooms. However, areas that fail the nutrient (nitrogen and phosphorus) objective are of concern because these nutrients also stimulate the growth of fouling organisms on the leaf surfaces. Computer simulation modeling are used to address the complex relationships among the SAV habitat objectives and help refine nutrient reduction strategies for each tributary as appropriate.

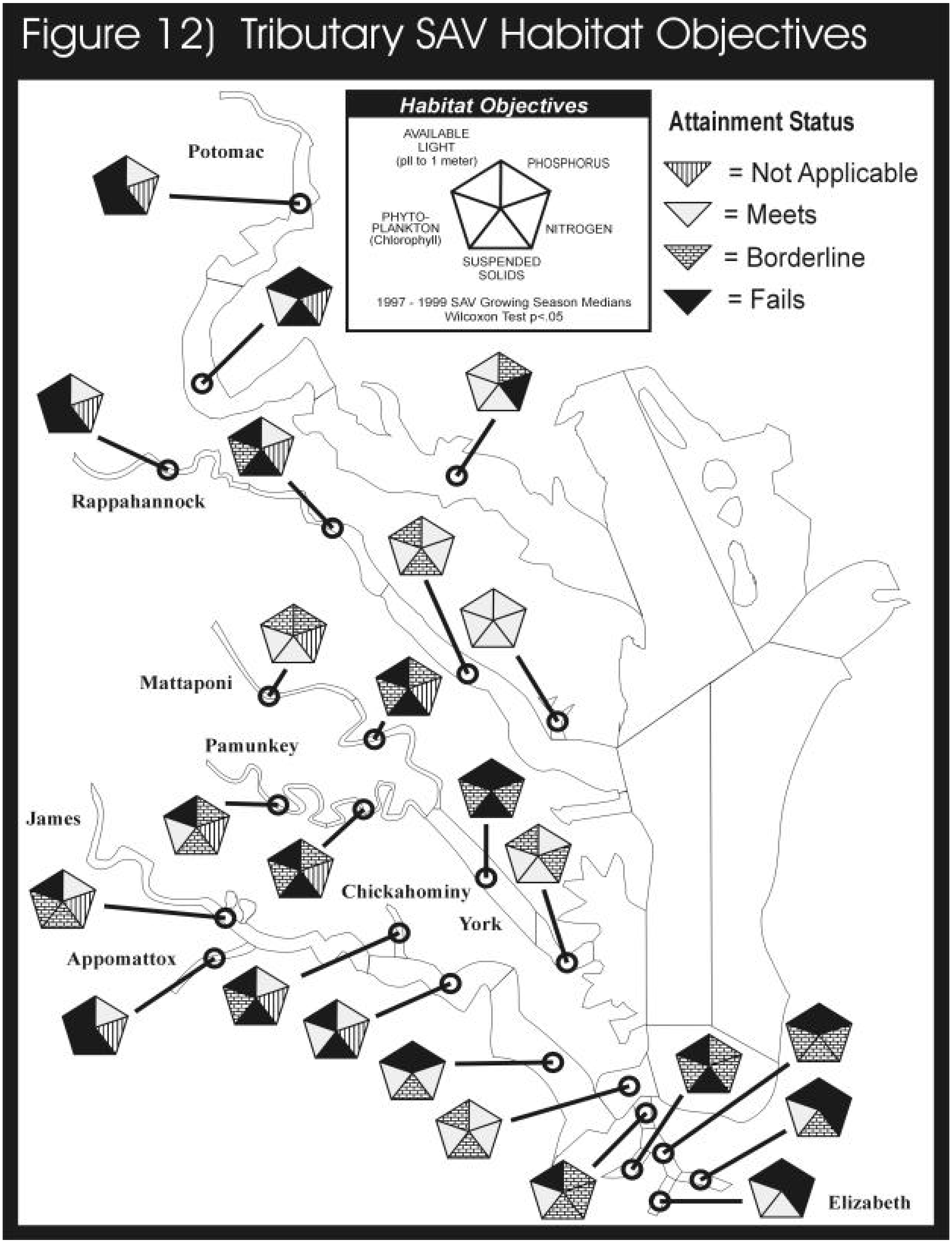


Figure 12) Tributary SAV Habitat Objectives
Habitat Objectives
AVAILABLE LIGHT (pll to 1 meter)
PHOSPHORUS
NITROGEN
SUSPENDED SOLIDS
PHYTO-PLANKTON (Chlorophyll)
1997 - 1999 SAV Growing Season Medians
Wilcoxon Test p<.05
Attainment Status
= Not Applicable
= Meets
= Borderline
= Fails
Potomac
Rappahannock
Mattaponi
Pamunkey
James
Chickahominy
York
Appomattox
Elizabeth

Figure 13 shows current **Virginia Chesapeake Bay** water quality conditions in relation to SAV habitat objectives. There are several disturbing environmental patterns here. It is of particular concern that the **Pocomoke Sound** segment fails, and the **Tangier Sound** is borderline for water clarity. This is likely due to high suspended solids levels as indicated by the failure for this objective in the **Pocomoke Sound** and borderline rating in **Tangier Sound**. There has also been a trend since 1985 of increasing suspended solids and declining water clarity in these segments. These segments are among those with the most extensive SAV habitat and the SAV abundance has been generally declining since 1992-1993.

Among the five habitat objectives shown in figures 12 and 13, light is the one that is met in the least number of segments (meeting the objective in only 26% of the segments). Closely associated with this is suspended solids objective, which is met in only 32% of the segments. The dissolved inorganic nitrogen and dissolved inorganic phosphorus objectives are met in 55% and 58% of the segments respectively. Chlorophyll is the most widely met objective, achieving satisfactory low levels in 68% of the segments.

As stated previously, light availability is the primary factor influencing the survival of SAV and reduced water clarity in the Chesapeake Bay is one of the major environmental challenges being addressed by the Chesapeake Bay Program. By comparing monitoring data against the available light habitat objective, we can assess the potential for SAV restoration to various water depths. Other factors such as sediment type, wave exposure, and parent material also will effect SAV re-population, but light availability is by far the controlling factor. Table 11 shows the percentage of segments within the bay system which currently have enough light availability to support SAV growth to various water depths. Currently, all (i.e. 100%) of the **Potomac**, **Rappahannock**, and **Virginia Chesapeake Bay** segments have enough light availability to support SAV growth at a .25 meter depth. In the **York** and **James**, only 50% and 45% of the segments respectively, have sufficient light availability to support SAV growth to a depth of .25 meters. The Tier II goal of the Bay Program is to restore SAV to all suitable areas at a depth of 1 meter. As can be seen in table 11, only 50% of the **Virginia Chesapeake Bay** segments, and 25% of the **Rappahannock** currently have sufficient water clarity to support this goal. No segments of the **Potomac**, **York**, or **James** currently have sufficient light availability to support the tier II goal.

Table 11. Segments meeting available light requirements (1996-1998).

Basin	To 2 meters (Tier III goal)	To 1 meter (Tier II Goal)	To .5 meters	To .25 meters
Potomac	0%	0%	33%	100%
Rappahannock	0%	25%	50%	100%
York	0%	0%	33%	50%
James	0%	0%	18%	45%
Chesapeake Bay	0%	50%	88%	100%

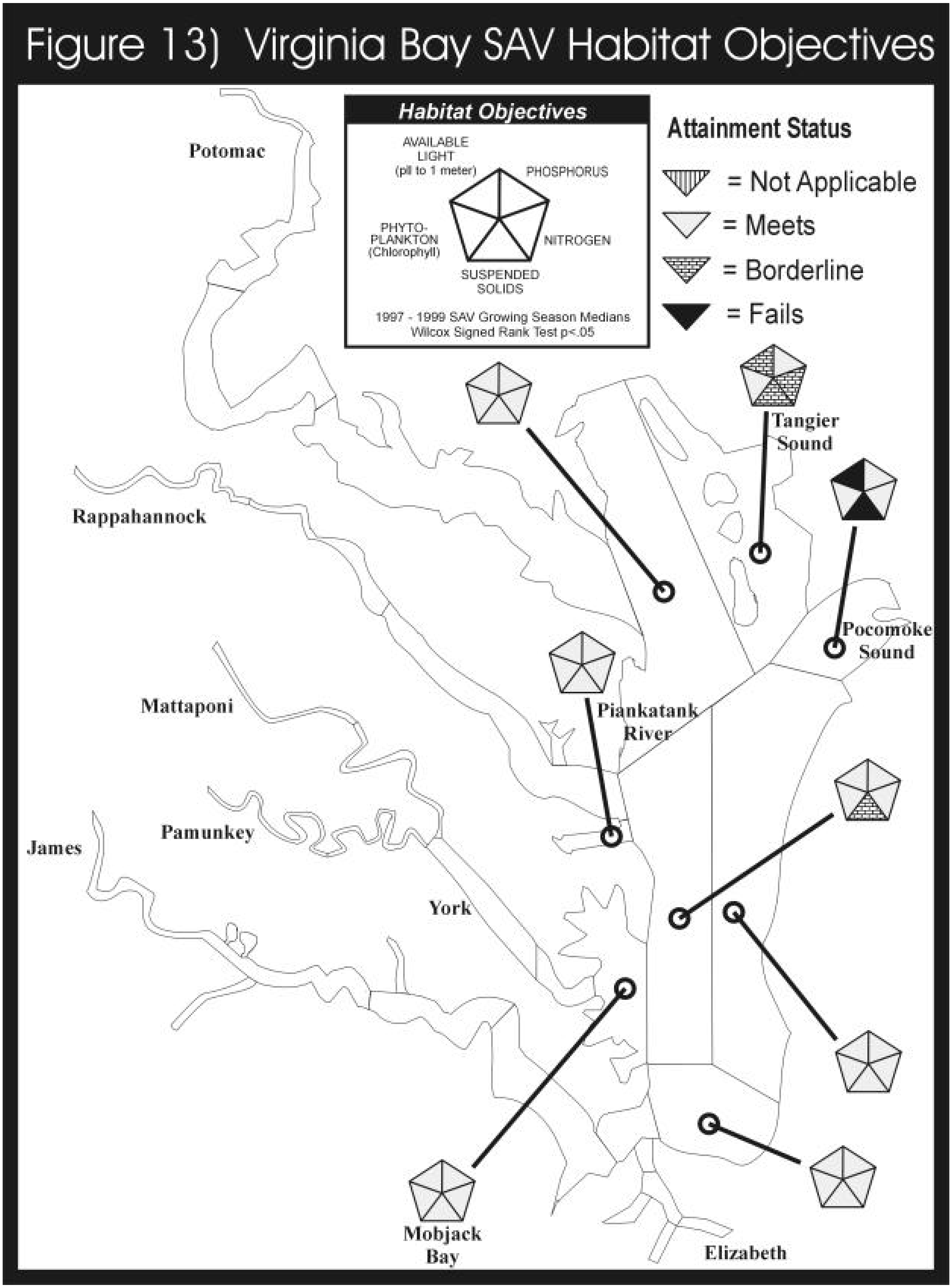


Figure 13) Virginia Bay SAV Habitat Objectives
Habitat Objectives
AVAILABLE LIGHT (pll to 1 meter)
PHOSPHORUS
NITROGEN
SUSPENDED SOLIDS
PHYTO-PLANKTON (Chlorophyll)
1997 - 1999 SAV Growing Season Medians
Wilcox Signed Rank Test p<.05
Attainment Status
= Not Applicable
= Meets
= Borderline
= Fails
Potomac
Rappahannock
Mattaponi
Pamunkey
James
York
Tangier Sound
Pocomoke Sound
Piankatank River
Mobjack Bay
Elizabeth

V. PHYTOPLANKTON COMMUNITIES

Phytoplankton are small plants (often composed of only a single cell) which utilize sunlight and nutrients to grow and reproduce. The phytoplankton community represents an important ecological component in the Chesapeake Bay ecosystem because all other ecologically and economically important species rely on this component for the oxygen they produce, and as the primary contributor of food at the base of their food webs. Changes in the composition and balance of certain phytoplankton components can result in the reduction, or elimination, of species within the higher levels of the food chain. Knowledge of phytoplankton populations provides an early warning of environmental changes that are having an impact on commercial species populations, and which could result in widespread ramifications. Phytoplankton populations are also very sensitive and responsive to changes in nutrient conditions.

Figure 14) Phytoplankton Community Trends

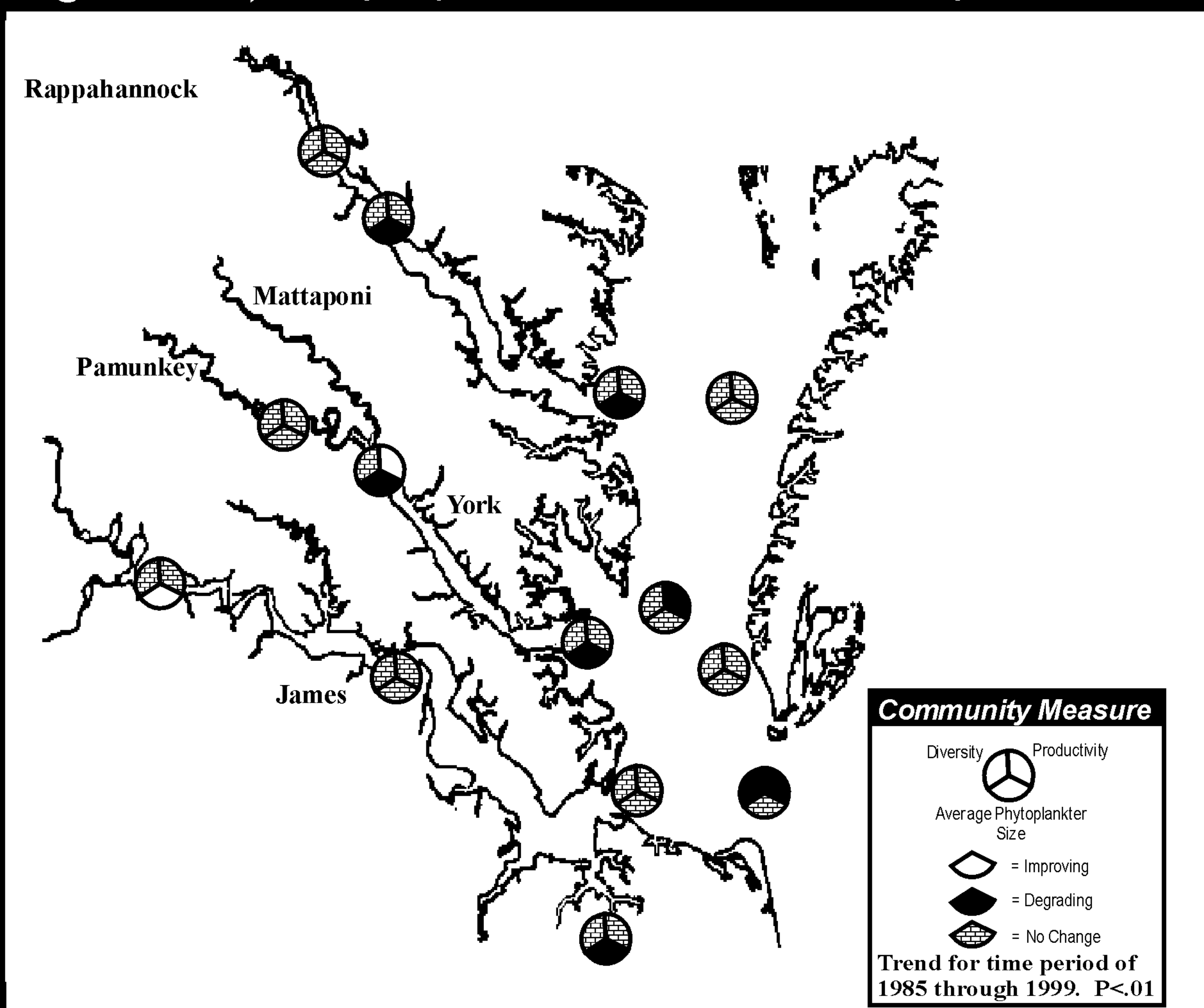


Figure 14 shows the trends during the last 15 years of three important phytoplankton community measures (diversity, productivity, and individual phytoplankter size). Diversity is a measure of the number of different types of plankton. The present phytoplankton diversity of the Virginia Chesapeake Bay and tributaries is generally good and contains many of the more favorable algae (e.g. diatoms) that function as active food and oxygen producers within these waters. There has been no significant change in phytoplankton community diversity except for at the Bay mouth, which shows a degrading (i.e. decreasing) diversity trend since 1985. This trend is possibly a response to the decreasing trend in salinity that has been observed throughout the lower Bay. However, within the phytoplankton community there are some less favorable algal populations that are becoming more abundant at several locations (e.g. cyanobacteria, dinoflagellates). This trend is evident in the degrading (i.e. decreasing) average phytoplankter size at several stations in figure 14. These smaller phytoplankton types tend to be less desirable for other organisms and also tend to produce more algae “blooms”. It is not yet certain if the negative trends are long term trends leading to major shifts in population composition, or if they represent short-term responses to cyclic environmental events (e.g. extended wet and/or dry years, changing salinity patterns, etc.).

There are a few improving trends occurring in the tidal fresh upper **James** and **York** rivers. Productivity, which is a measure of growth rate, is improving (i.e. decreasing) in the **York**. Average phytoplankter size is improving (i.e. increasing) in the **James**. This indicates an increased proportion of larger, more desirable, species (e.g. diatoms) in this region of the river.

VI. ZOOPLANKTON COMMUNITIES

Zooplankton communities are small animal organisms near the base of the food web. This includes egg, larval, and juvenile stages of many economically valuable animals (e.g. fish, crabs and oysters), and other noncommercial animals (e.g. jellyfish, barnacles). The zooplankton community also includes many animals that remain small throughout their life cycles (e.g. copopods, rotifers). Zooplankton feed on phytoplankton and are in turn eaten by larger animals. As such, they can provide environmental indications of changes in both water quality conditions (e.g. nutrients) and conditions in important harvestable species (e.g. Striped Bass).

Figure 15) Zooplankton Community Trends

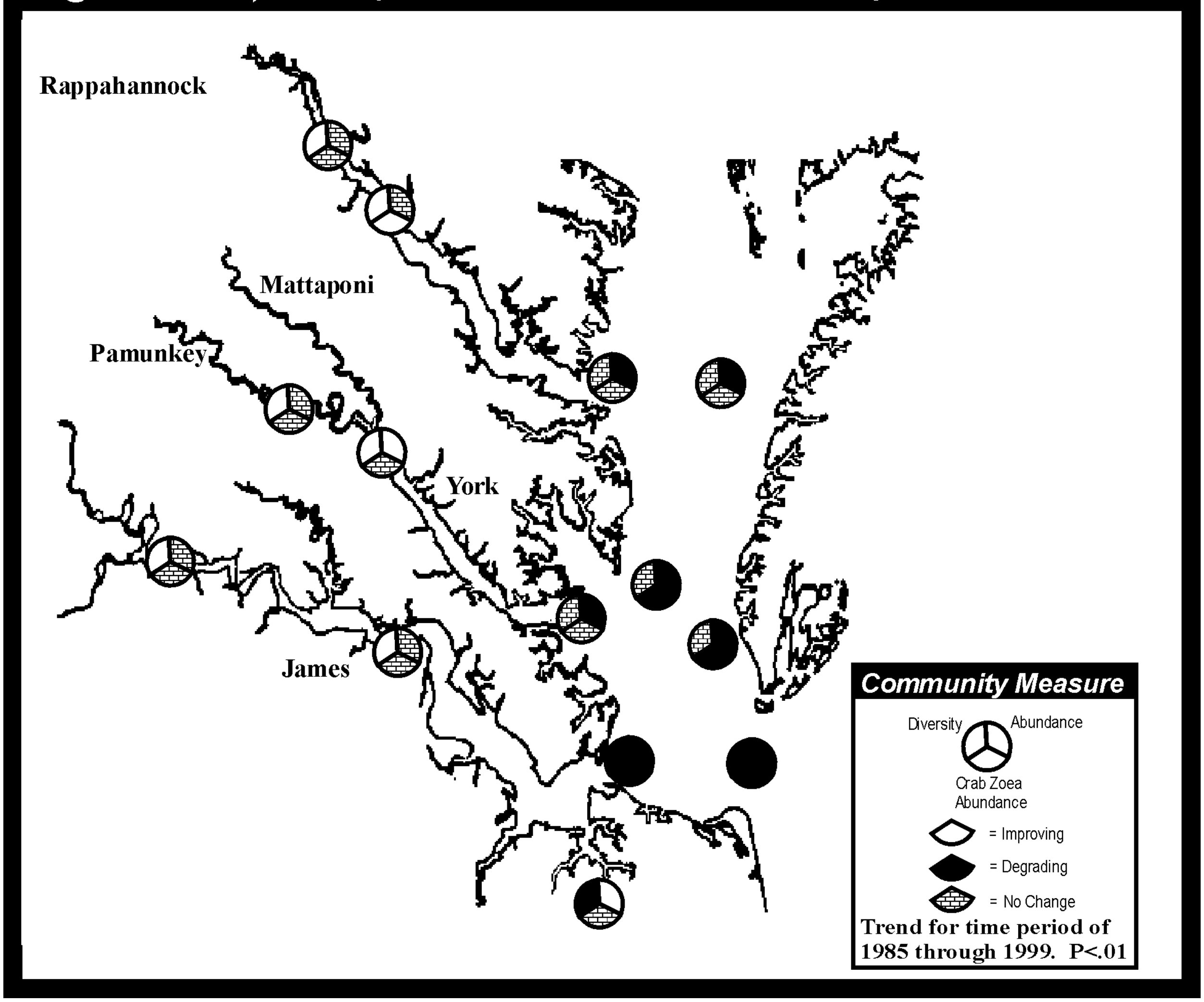


Figure 15 shows long-term trends in three important zooplankton community measures (diversity, abundance, and crab zoea abundance). The overall patterns reflect closely the general status and trends of water quality. Where water quality indicators have shown improving trends noted earlier in this report (e.g. within the **James**, **York**, **Pamunkey**, and **Rappahannock**), the zooplankton community has been stable or is improving in several instances. Conversely, water quality changes in **Virginia Chesapeake Bay** (i.e. degrading water clarity and suspended solids) are coincident with degrading trends in total community abundance, diversity, and crab zoea abundance at several locations. It is probably a mix of human induced changes and natural conditions that are causing these changes. The human induced causes are probably the water clarity degradation noted earlier in this report possibly caused by ineffective control of non-point source inputs from land disturbing activities. The other human induced cause possibly related to these trends are the crab zoea abundance declines noted at several stations. This crab zoea abundance measures early life stages of many types of crabs found in the Bay. Scientists have been concerned with blue crab overharvesting in recent years and these declines in crab zoea abundance may be related to this. However, influences not controllable by resource management may be responsible for some of these degrading trends in zooplankton. High riverflows, increased shoreline erosion due to sea level rise, and re-suspension of materials due to changing wind patterns may be responsible for some of the suspended solids degradation effecting the zooplankton communities. Also, the decreasing salinity observed throughout the **Virginia Chesapeake Bay** may be a natural process effecting these degrading patterns.

VII. BENTHIC COMMUNITIES

Benthic communities are bottom dwelling organisms living in the sediments at the bottom of the Bay. They are a food source for many fish and waterfowl species. Their immobility and longevity makes them a sensitive integrative indicator of the Bay's health. Both toxic contaminants and low dissolved oxygen levels can affect their populations. The following discussion relates only to the general condition of benthic communities in soft sediments (i.e. muds and sands) that are not subject to commercial harvest.

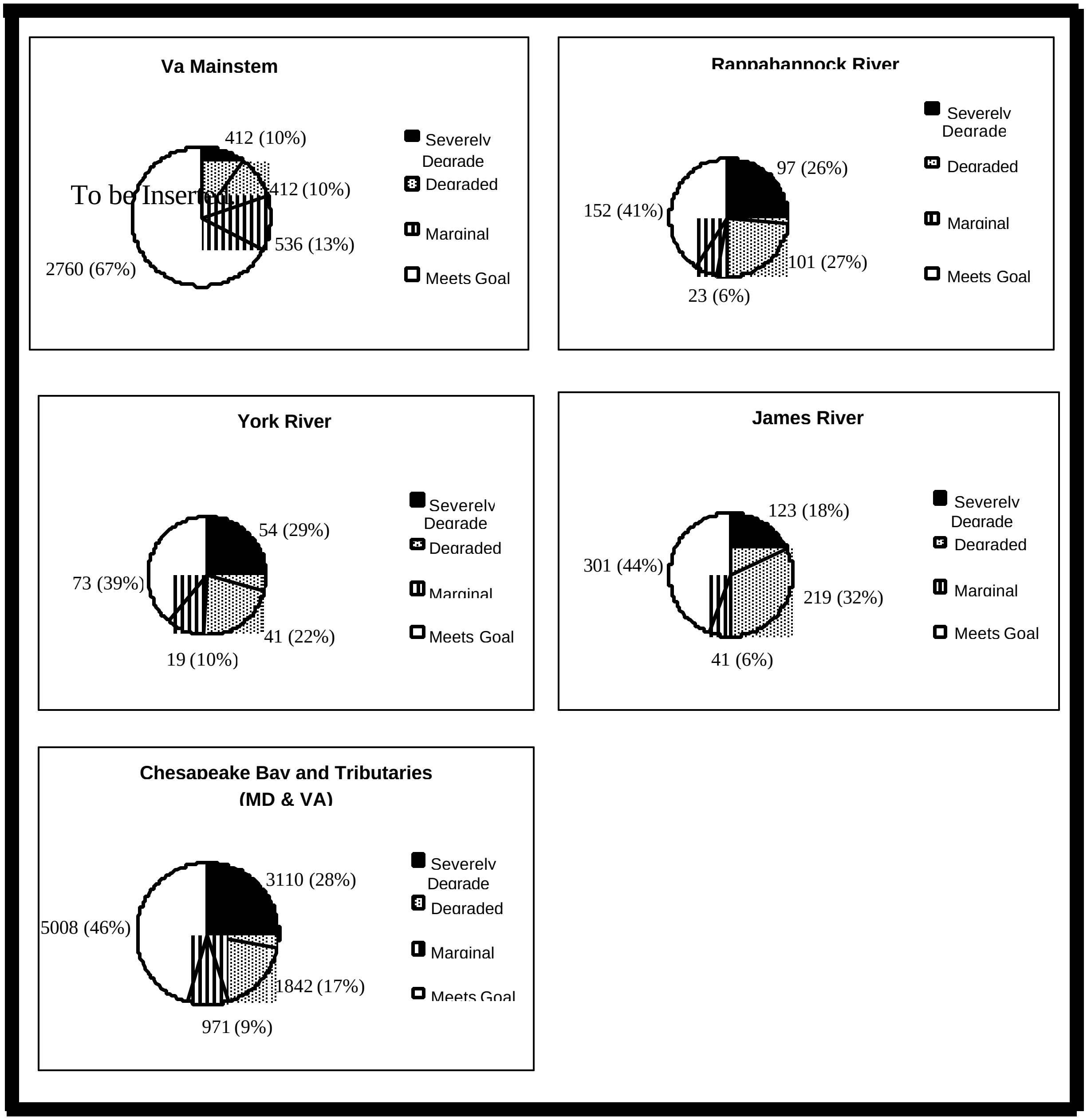
The benthic community health and habitat condition is assessed through an Index of Biological Integrity (IBI). This benthic IBI is determined by examining benthic biodiversity measures, measures of assemblage abundance and biomass, life history strategy measures, activity beneath the sediment surface, and feeding methods. Figure 16 shows the current (1996-1999 period) aerial amounts of degraded benthic habitat in the Chesapeake Bay system and various sub-areas. In general, Virginia's three primary tributaries - the **James**, **York** and **Rappahannock** rivers- have higher percentages of area with stressed benthic communities compared to the **Virginia Chesapeake Bay** Mainstem.

Benthic communities in the **James** are currently considered amongst the healthiest of the major tributaries in the Chesapeake Bay system. Benthic community condition has been improving at fixed stations in the Upper and Middle **James** River since 1986. The status of the benthic communities in the **Elizabeth** is poor and is most likely related to the levels of contaminants in the sediments more than water quality conditions. Encouragingly, there has been a significant improving trend in the benthos at the station in the Southern Branch of the **Elizabeth** River since 1986. On an aerial basis, 44% of the **James** meets restoration goals established by the Chesapeake Bay program (figure 16).

The **York** River has poor benthic communities in much of its length. Low bottom dissolved oxygen does not seem to be a contributing factor in explaining the poor status of the **York** River benthos and it may be more related to physical factors such as tidal currents or sediment type. Trend analysis of the benthic IBI indicates degradation in the middle segment of the **York** and improving conditions at the mouth of the river. On an aerial basis, 39% of the **York** meets restoration goals established by the Chesapeake Bay program (figure 16).

The **Rappahannock** River has a fair benthos in up-river segment but poor benthos in the segments near its mouth. Benthic communities are deteriorating in a portion of the middle of the river since 1986 but stable elsewhere. Stations in the lower river region are degraded primarily due to annual low dissolved oxygen events during summer. On an aerial basis, 41% of the **Rappahannock** meets restoration goals established by the Chesapeake Bay program (figure 16). The Lower **Virginia Chesapeake Bay** mainstem is the healthiest region of the entire Chesapeake Bay and there have been no significant trends in the benthic IBI since 1986. On an aerial basis, 67% of the area meets the restoration goals established by the Chesapeake Bay program (figure 16).

Figure 16. Estimated tidal area (km^2) failing to meet the Chesapeake Bay Benthic Community Restoration Goals in the Chesapeake Bay, James, York and Rappahannock Rivers based on an average of results reported between 1996 and 1999.



GLOSSARY OF TERMS

Anadromous Fish: Fish that spend most of their life in salt water but migrate into freshwater tributaries to spawn.

Anoxia: The absence of oxygen within an ecosystem. Within the context of the Chesapeake Bay program, it is when oxygen is measured at a concentration level of zero milligrams per liter.

Anthropogenic: of human origins

Benthic Communities: Organisms such as worms, insects, and some shellfish that live within and at the surface of the sediment at the bottom of the river. The ecological role of these organisms is complex and important. It includes controlling the degradation and processing of living and dead organic material in the sediment and serving as an essential link in the "food web" which supports higher levels of life.

Best Management Practices (BMP): A practice or combination of practices that are determined to be the most effective and practical (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutant levels compatible with environmental quality goals.

Biological Nutrient Reduction (BNR): A modified form of activated sludge wastewater treatment that enhances phosphorous and nitrogen removal by microbial organisms instead of traditional chemical addition systems. For the purpose of the strategy process, BNR is described as a "3-stage system," using a sequence of anaerobic-anoxic-aerobic reactor basins. Increased phosphorus removal is accomplished by creating environmental conditions that encourage the biomass to accumulate increased quantities of phosphorus, which are then settled and removed in the water sludge. Nitrogen removal occurs because nitrate-nitrogen contained in the recycle stream is converted to nitrogen gas in this process and released to the atmosphere.

Biomass: The total mass of living matter within a given volume of an environment (expressed as a concentration or weight per unit area.)

CBLAD: Chesapeake Bay Local Assistance Department

CBP: Chesapeake Bay Program - Federal Environmental Protection Agency

Chlorophyll: A compound present in all green plants used for the conversion of sunlight into useful biochemical energy. Chlorophyll is often used to measure the amount of phytoplankton biomass in water. Excess amounts of chlorophyll indicate high amounts of phytoplankton.

Conservation Tillage: Any tillage or planing system that leaves at least 30% of the soil surface covered with crop residue after planting. Examples are no-till, ride tillage, strip tillage, etc.

Controllable Nutrient Load: It represents the portion of the total nutrient loads caused by human activities rather than those loads attributable to natural processes.

Conventional Tillage: Complete inversion of the soil incorporating all residues with a moldboard plow, or any practice that leaves less than 30% residue on the soil surface.

Cover Crops: Crops, such as rye, wheat or barley, that are planted without fertilizer in the early fall in order to trap leftover nitrogen so it will not leach into the soil and groundwater. These crops also reduce winter time erosion of the soil.

DCR: Virginia Department of Conservation and Recreation

DEQ: Virginia Department of Environmental Quality

DGIF: Virginia Department of Game and Inland Fisheries

DOF: Virginia Department of Forestry

Diatoms: Tiny, single-celled or colonial algae with skeletons made of silica that either drift with the motion of the water or are attached to surfaces.

Dinoflagellate: Algae of the order Dinoflagellata.

Dissolved Oxygen: An essential element for the survival of aerobic organisms. Oxygen becomes dissolved into water through diffusion from the atmosphere or surface agitation (i.e., waves). In bottom waters farthest away from the surface, dissolved oxygen can be consumed by aquatic organisms at a faster rate than it is supplied. This can lead to hypoxia (oxygen concentration levels less than 2 mg/l) of anoxia (0/mg/l). Hypoxic or anoxic conditions lead to the death of aquatic organisms and/or the loss of useful habitat.

Estuary: A partially enclosed body of water having a mixture of salt water from the ocean and fresh water from rivers and streams.

Eutrophication: A natural process of "aging" of water bodies caused by increasing nutrient availability and cycling. This process is greatly accelerated by anthropogenic (i.e., human caused inputs of nutrients. When abnormally accelerated, negative ecological impacts such as anoxia and instabilities in biological communities occur. Ecological measurements to track impacts of eutrophication include measurement of nutrient concentrations, water clarity, dissolved oxygen and those biological communities most directly linked to nutrient enrichment impacts (e.g., benthic, phytoplankton, zooplankton).

Fall Line: A line joining the waterfalls of several rivers that marks the point where each river descends from the upland (Piedmont) region to the lowland (Coastal Plains) region and marks the limit of navigability of each river.

Hypoxic: A condition where only very low levels of oxygen are present.

Limiting Nutrient: The specific nutrient (usually nitrogen or phosphorus in aquatic systems) which controls the rate of phytoplankton growth due to a decreased concentration relative to plant needs and in reference to other nutrients present.

Limits of Technology (LOT): Regarding point source phosphorus removal, LOT usually consists of very elaborate chemical addition and filtering systems placed after secondary wastewater treatment. For point source nitrogen removal, LOT may consist of breakpoint chlorination or a "5-stage" BNR system, using a sequence of aerobic-dual anoxic-dual aerobic reactor basins. LOT systems are expensive to construct, operate, and maintain. LOT is capable of achieving very low levels of nutrients in effluent, with monthly averages on the order of 3 mg/l total nitrogen, and 0.075 mg/l total phosphorus. In terms of nonpoint sources, LOT consists of 100% implementation of BMP practices on agricultural, urban, and forest lands.

NRCS: USDA Natural Resources Conservation Service

Nitrification: The biochemical oxidation of, or any other natural or artificial process of converting, the ammonium form of nitrogen to its nitrate form.

Nitrogen: An essential nutrient for the growth of living organisms. It is found throughout the environment in particulate and dissolved forms in both living and non-living compounds. It will readily remain in a dissolved form, and therefore, anthropogenic inputs of this nutrient often occur through groundwater pathways as a result of excess nutrient application. Its main biochemical function is in the formation of amino acids which are the main building blocks for the formation of living biomass.

Nonpoint Source (NPS) Pollution: Diffused pollutants that are washed off the land during the natural process of rainwater flowing across the land to rivers, lakes, oceans and other water bodies.

Nutrients: Elements or compounds, such as carbon, nitrogen, phosphorus, essential as raw material for the growth and development of plants and animals.

ODU: Old Dominion University

Pasture: Grazing lands planted primarily with introduced or domesticated native forage species that receive periodic renovation and/or cultural treatments such as tillage, fertilization, mowing, weed control, and irrigation. These lands are not in rotation with crops.

Phosphorus: An essential nutrient for the growth of living organisms. It is found throughout the environment in particulate and dissolved forms in both living and non-living compounds. It will readily absorb to sediments, and therefore anthropogenic input of this nutrient often occurs through sediment runnoff from agricultural activities or bank erosion. Its main biochemical function is in the formation of ATP (Adenosine Triphosphate), a form of energy storage for cellular metabolism.

Phytoplankton Communities: Small plants, often called "algae," growing within the water column. Phytoplankton produce much of the organic material for the "food web" of the Chesapeake Bay. Changes in the structure and productivity of the phytoplankton community can be caused by eutrophication and can create imbalances in the ecology of aquatic ecosystems.

Point Source (PS) Pollution: Discharges of treated or untreated effluent from industries, wastewater treatment plants and other sources that can be traced back to a single point of discharge.

Primary Producers: Organisms, such as algae, that convert solar energy to organic substances through the molecule, chlorophyll. Primary producers serve as a food source for higher organisms.

Propagule: Soil, silt, and other material that is suspended in water and eventually settles out on the bottom of a river, lake, or other body of water.

Septic System Management: Septic system management includes three specific practices to reduce nutrient losses from septic systems. These are regular pumping of the system, installation of nitrogen removing (i.e., denitrification) components, and bypassing a septic system by connecting to a sanitary sewer. Currently, regular pumping of septic systems is the only practice in widespread use.

Submerged Aquatic Vegetation (SAV): Large aquatic plants that grow permanently underwater or are exposed only at low tide. They provide food for waterfowl, sediment stabilization and shoreline erosion control, and serve as critical habitat areas for both juvenile and adult forms of many aquatic animals. A baywide reduction in SAV during the 1970s was one of the major indicators of degradation which spurred implementation of the interstate Chesapeake Bay Program

Storm Flow: Rainfall runoff that reaches a stream channel during, or soon after a rainfall event that causes high rates of discharge.

Trend Analysis: A formal statistical process that is used to determine the presence or absence of changes in measures or water quality over time or a geographical area.

Tributary: A body of water flowing into a larger body of water.

VDH: Virginia Department of Health

VIMS: Virginia Institute of Marine Science, College of William & Mary

Water Clarity: An ecological measure of health of aquatic ecosystems, water clarity is a measure of light availability in the water column. Reduced water clarity can be caused by increases in phytoplankton or suspended aquatic vegetation (SAV) in the Chesapeake Bay and its tributaries.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Zooplankton Communities: Small (generally <1mm in size) animals growing within the water column. Most remain small organisms which grow into much larger adults (e.g., fish eggs and crab larvae). A major ecological function of zooplankton is in linking the production of phytoplankton and bacteria into higher levels of the food web. The zooplankton community forms the bulk of the diet for most larval and juvenile fish, crabs and shellfish. Because of the short life cycle of these animals, they respond quickly to environmental conditions and are good indicators of both short term and long term conditions.

APPENDIX A

Article 2, Chapter 5.1 of Title 2.1 of the Code of Virginia and Item 405 of the 2000 Appropriations Act

<u>§ 2.1-51.12:1. Development of strategies to restore the water quality and living resources of the Chesapeake Bay and its tributaries</u>.

The Secretary of Natural Resources shall coordinate the development of tributary plans designed to improve water quality and restore the living resources of the Chesapeake Bay and its tributaries. Such plans shall be tributary specific in nature and prepared for the Potomac, Rappahannock, York, and James River Basins as well as the western coastal basins (comprising the small rivers on the western Virginia mainland that drain to the Chesapeake Bay, not including the Potomac, Rappahannock, York and James Rivers) and the eastern coastal basin (encompassing the creeks and rivers of the Eastern Shore of Virginia that are west of U.S. Route 13 and drain to the Chesapeake Bay). Each plan shall address the reduction of nutrients and suspended solids, including sediments, entering the Chesapeake Bay and its tributaries. Each plan shall also summarize other existing programs, strategies, goals and commitments for reducing toxics; the preservation and protection of living resources; and the enhancement of the amount of submerged aquatic vegetation, for each tributary basin and the Bay. The plans shall be developed in consultation with affected stakeholders, including, but not limited to, local government officials; wastewater treatment operators; seafood industry representatives; commercial and recreational fishing interests; developers; farmers; local, regional and statewide conservation and environmental interests; the Virginia Chesapeake Bay Partnership Council; and the Virginia delegation to the Chesapeake Bay Commission.

§ 2.1-51.12:2. Tributary plan content; development timelines.

A. Each tributary plan developed pursuant to § 2.1-51.12:1 shall include the following:

1. Recommended specific strategies, goals, commitments and methods of implementation designed to achieve the nutrient goals of the 1987 Chesapeake Bay Agreement and the 1992 amendments to that agreement signed by the Governors of Virginia, Maryland, and Pennsylvania, the Mayor of the District of Columbia, the Administrator of the United States Environmental Protection Agency and the Chairman of the Chesapeake Bay Commission, collectively known as the Chesapeake Executive Council.

2. Recommended specific strategies, goals, commitments and methods of implementation to achieve sediment and suspended solids reductions from nonpoint sources sufficient to achieve living resource goals, particularly those related to habitat conditions necessary to support submerged aquatic vegetation.

3. A report on progress made pursuant to the "Chesapeake Bay Basinwide Toxics Reduction and Prevention Strategy" signed by the Chesapeake Executive Council on October 14, 1994, that is applicable to the tributary for which the plan is prepared.

4. A report on progress on the "Submerged Aquatic Vegetation Restoration Goals" signed by the Chesapeake Executive Council on September 15, 1993, that is applicable to the tributary for which the

plan is prepared.
5. A report on progress related to the objectives of the "Local Government Partnership Initiative" signed by the Chesapeake Executive Council on November 30, 1995.

6. Specifically identified recommended state, local and private responsibilities and actions, with associated timetables, for implementation of the plan, to include the (i) person, official, governmental unit, organization or other responsible body; (ii) specific programmatic and environmental benchmarks and indicators for tracking and evaluating implementation and progress; (iii) opportunities, if appropriate, to achieve nutrient reduction goals through nutrient trading; (iv) estimated state and local benefits derived from implementation of the proposed alternatives in the plan; (v) state funding commitments and specifically identified sources of state funding as well as a method for considering alternative or additional funding mechanisms; (vi) state incentives for local and private bodies for assisting with implementation of the plans; and (vii) estimate and schedule of costs for the recommended alternatives in each plan.

7. Scientific documentation to support the recommended actions in a plan and an analysis supporting the documentation if it differs from the conclusions used by the Chesapeake Bay Program.

8. An analysis and explanation of how and when the plan is expected to achieve the elements of subdivisions 1, 2, 3 and 4 of this subsection.

9. A process for and schedule of adjustment of the plan if reevaluation concludes that the specific nutrient reduction goals will not be met.

10. An analysis of the cost effectiveness and equity of the recommended nutrient reduction alternatives.

11. An opportunity for public comment and a public education and information program that includes but is not limited to information on specific assignments of responsibility needed to execute the plan.

B. Tributary plans shall be developed by the following dates for the:

1. Potomac River Basin, January 1, 1997.
2. Rappahannock River Basin, January 1, 1999.
3. York River Basin, July 1, 1998.
4. James River Basin, July 1, 1998.
5. Eastern and western coastal basins, January 1, 1999.

C. In developing tributary plans, the Secretary shall consider, among other factors: (i) studies relevant to the establishment of nutrient, sediment and suspended solids reduction goals; (ii) the relative contributions and impacts of point and nonpoint sources of nutrients; (iii) the scientific relationship between nutrient, sediment and suspended solids controls and the attainment of water quality goals; and (iv) estimates of costs for each publicly owned treatment works affected by point source nutrient reduction goals and estimates of costs for nonpoint source nutrient, sediment and suspended solids reduction goals.

D. In any tributary plan reevaluation, the Secretary shall consider, among other factors: (i) whether all publicly owned treatment works in the basin under consideration have either installed biological nutrient removal technology or achieved equivalent nutrient reduction by other means; (ii) total nutrient reductions achieved by nonpoint sources to the tributary; (iii) the need for additional nutrient controls for the attainment of water quality goals; (iv) a comparison between nutrient reductions achieved by point source controls and nonpoint source controls in order to equitably allocate any additional reductions; and (v) the cost effectiveness, including nutrient trading options, of any additional nutrient reduction controls.

Item 405, 2000 Appropriations Act

The Secretary of Natural Resources shall report to the Chairmen of the Senate Committees on Finance and Agriculture, Conservation, and Natural Resources, and the House Committees on Appropriations and Conservation and Natural Resources, by November 4 of each year on implementation of the Chesapeake Bay nutrient reduction strategies. The report shall include and address the progress and costs of point source and nonpoint source pollution strategies. The report shall include, but not be limited to, information on levels of dissolved oxygen, acres of submerged aquatic vegetation, computer modeling, variety and numbers of living resources, and other relevant measures General Assembly to evaluate the progress and effectiveness of the tributary strategies. In addition, the Secretary shall include information on the status of all of Virginia's commitments to the Chesapeake Bay Agreements.

APPENDIX B

Chesapeake 2000 Agreement

CHESAPEAKE 2000

PREAMBLE

The Chesapeake Bay is North America's largest and most biologically diverse estuary, home to more than 3,600 species of plants, fish and animals. For more than 300 years, the Bay and its tributaries have sustained the region's economy and defined its traditions and culture. It is a resource of extraordinary productivity, worthy of the highest levels of protection and restoration.

Accordingly, in 1983 and 1987, the states of Virginia, Maryland, Pennsylvania, the District of Columbia, the Chesapeake Bay Commission and the U.S. Environmental Protection Agency, representing the federal government, signed historic agreements that established the Chesapeake Bay Program partnership to protect and restore the Chesapeake Bay's ecosystem.

For almost two decades, we, the signatories to these agreements, have worked together as stewards to ensure the public's right to clean water and a healthy and productive resource. We have sought to protect the health of the public that uses the Bay and consumes its bounty. The initiatives we have pursued have been deliberate and have produced significant results in the health and productivity of the Bay's main stem, the tributaries, and the natural land and water ecosystems that compose the Chesapeake Bay watershed.

While the individual and collective accomplishments of our efforts have been significant, even greater effort will be required to address the enormous challenges that lie ahead. Increased population and development within the watershed have created ever-greater challenges for us in the Bay's restoration. These challenges are further complicated by the dynamic nature of the Bay and the ever-changing global ecosystem with which it interacts.

In order to achieve our existing goals and meet the challenges that lie ahead, we must reaffirm our partnership and recommit to fulfilling the public responsibility we undertook almost two decades ago. We must manage for the future. We must have a vision for our desired destiny and put programs into place that will secure it.

To do this, there can be no greater goal in this recommitment than to engage everyone — individuals, businesses, schools and universities, communities and governments — in our effort. We must encourage all citizens of the Chesapeake Bay watershed to work toward a shared vision — a system with abundant, diverse populations of living resources, fed by healthy streams and rivers, sustaining strong local and regional economies, and our unique quality of life.

In affirming our recommitment through this new *Chesapeake 2000*, we recognize the importance of viewing this document in its entirety with no single part taken in isolation of the others. This Agreement reflects the Bay's complexity in that each action we take, like the elements of the Bay itself, is connected to all the others. This Agreement responds to the problems facing this magnificent ecosystem in a comprehensive, multifaceted way.

By this Agreement, we commit ourselves to nurture and sustain a Chesapeake Bay Watershed Partnership and to achieve the goals set forth in the subsequent sections. Without such a partnership, future challenges will not be met. With it, the restoration and protection of the Chesapeake Bay will be ensured for generations to come.

We commit to:

LIVING RESOURCE PROTECTION AND RESTORATION

The health and vitality of the Chesapeake Bay's living resources provide the ultimate indicator of our success in the restoration and protection effort. The Bay's fisheries and the other living resources that sustain them and provide habitat for them are central to the initiatives we undertake in this Agreement.

We recognize the interconnectedness of the Bay's living resources and the importance of protecting the entire natural system. Therefore, we commit to identify the essential elements of habitat and environmental quality necessary to support the living resources of the Bay. In protecting commercially valuable species, we will manage harvest levels with precaution to maintain their health and stability and protect the ecosystem as a whole. We will restore passage for migratory fish and work to ensure that suitable water quality conditions exist in the upstream spawning habitats upon which they depend.

Our actions must be conducted in an integrated and coordinated manner. They must be continually monitored, evaluated and revised to adjust to the dynamic nature and complexities of the Chesapeake Bay and changes in global ecosystems. To advance this ecosystem approach, we will broaden our management prospective from single-system to ecosystem functions and will expand our protection efforts by shifting from single-species to multi-species management. We will also undertake efforts to determine how future conditions and changes in the chemical, physical and biological attributes of the Bay will affect living resources over time.

GOAL

Restore, enhance and protect the finfish, shellfish and other living resources, their habitats and ecological relationships to sustain all fisheries and provide for a balanced ecosystem.

Oysters

• By 2010, achieve, at a minimum, a tenfold increase in native oysters in the Chesapeake Bay, based upon a 1994 baseline. By 2002, develop and implement a strategy to achieve this increase by using sanctuaries sufficient in size and distribution, aquaculture, continued disease research and disease-resistant management strategies, and other management approaches.

Exotic Species

• In 2000, establish a Chesapeake Bay Program Task Force to:

1. Work cooperatively with the U.S. Coast Guard, the ports, the shipping industry, environmental interests and others at the national level to help establish and implement a national program designed to substantially reduce and, where possible, eliminate the introduction of non-native species carried in ballast water; and

2. By 2002, develop and implement an interim voluntary ballast water management program for the waters of the Bay and its tributaries.

• By 2001, identify and rank non-native, invasive aquatic and terrestrial species which are causing or have the potential to cause significant negative impacts to the Bay's aquatic ecosystem. By 2003, develop and implement management plans for those species deemed problematic to the restoration and integrity of the Bay's ecosystem.

Fish Passage and Migratory and Resident Fish

• By June 2002, identify the final initiatives necessary to achieve our existing goal of restoring fish passage for migratory fish to more than 1,357 miles of currently blocked river habitat by 2003 and establish a monitoring program to assess outcomes.

• By 2002, set a new goal with implementation schedules for additional migratory and resident fish passages that addresses the removal of physical blockages. In addition, the goal will address the removal of chemical blockages caused by acid mine drainage. Projects should be selected for maximum habitat and stock benefit.

• By 2002, assess trends in populations for priority migratory fish species. Determine tributary-specific target population sizes based upon projected fish passage, and current and projected habitat available, and provide recommendations to achieve those targets.

• By 2003, revise fish management plans to include strategies to achieve target population sizes of tributary-specific migratory fish.

Multi-species Management

• By 2004, assess the effects of different population levels of filter feeders such as menhaden, oysters and clams on Bay water quality and habitat.

• By 2005, develop ecosystem-based multi-species management plans for targeted species.

• By 2007, revise and implement existing fisheries management plans to incorporate ecological, social and economic considerations, multi-species fisheries management and ecosystem approaches.

Crabs

• By 2001, establish harvest targets for the blue crab fishery and begin implementing complementary state fisheries management strategies Baywide. Manage the blue crab fishery to restore a healthy spawning biomass, size and age structure.

VITAL HABITAT PROTECTION AND RESTORATION

The Chesapeake Bay's natural infrastructure is an intricate system of terrestrial and aquatic habitats, linked to the landscapes and the environmental quality of the watershed. It is composed of the thousands of miles of river and stream habitat that interconnect the land, water, living resources and human communities of the Bay watershed. These vital habitats–including open water, underwater grasses, marshes, wetlands, streams and forests–support living resource abundance by providing key food and habitat for a variety of species. Submerged aquatic vegetation reduces shoreline erosion while forests and wetlands protect water quality by naturally processing the pollutants before they enter the water. Long-term protection of this natural infrastructure is essential.

In managing the Bay ecosystem as a whole, we recognize the need to focus on the individuality of each river, stream and creek, and to secure their protection in concert with the communities and individuals that reside within these small watersheds. We also recognize that we must continue to refine and share information regarding the importance of these vital habitats to the Bay's fish, shellfish and waterfowl. Our efforts to preserve the integrity of this natural infrastructure will protect the Bay's waters and living resources and will ensure the viability of human economies and communities that are dependent upon those resources for sustenance, reverence and posterity.

GOAL

Preserve, protect and restore those habitats and natural areas that are vital to the survival and diversity of the living resources of the Bay and its rivers.

Submerged Aquatic Vegetation

• Recommit to the existing goal of protecting and restoring 114,000 acres of submerged aquatic vegetation (SAV).

• By 2002, revise SAV restoration goals and strategies to reflect historic abundance, measured as acreage and density from the 1930s to the present. The revised goals will include specific levels of water clarity which are to be met in 2010. Strategies to achieve these goals will address water clarity, water quality and bottom disturbance.

• By 2002, implement a strategy to accelerate protection and restoration of SAV beds in areas of critical importance to the Bay's living resources.

Watersheds

• By 2010, work with local governments, community groups and watershed organizations to develop and implement locally supported watershed management plans in two-thirds of the Bay watershed covered by this Agreement. These plans would address the protection, conservation and restoration of stream corridors, riparian forest buffers and wetlands for the purposes of improving habitat and water quality, with collateral benefits for optimizing stream flow and water supply.

• By 2001, each jurisdiction will develop guidelines to ensure the aquatic health of stream corridors. Guidelines should consider optimal surface and groundwater flows.

• By 2002, each jurisdiction will work with local governments and communities that have watershed management plans to select pilot projects that promote stream corridor protection and restoration.

• By 2003, include in the "State of the Bay Report," and make available to the public, local governments and others, information concerning the aquatic health of stream corridors based on adopted regional guidelines.

• By 2004, each jurisdiction, working with local governments, community groups and watershed organizations, will develop stream corridor restoration goals based on local watershed management planning.

Wetlands

• Achieve a no-net loss of existing wetlands acreage and function in the signatories' regulatory programs.

• By 2010, achieve a net resource gain by restoring 25,000 acres of tidal and non-tidal wetlands. To do this, we commit to achieve and maintain an average restoration rate of 2,500 acres per year basin wide by 2005 and beyond. We will evaluate our success in 2005.

• Provide information and assistance to local governments and community groups for the development and implementation of wetlands preservation plans as a component of a locally based integrated watershed management plan. Establish a goal of implementing the wetlands plan component in 25 percent of the land area of each state's Bay watershed by 2010. The plans would preserve key wetlands while addressing surrounding land use so as to preserve wetland functions.

• Evaluate the potential impact of climate change on the Chesapeake Bay watershed, particularly with respect to its wetlands, and consider potential management options.

Forests

• By 2002, ensure that measures are in place to meet our riparian forest buffer restoration goal of 2,010 miles by 2010. By 2003, establish a new goal to expand buffer mileage.

• Conserve existing forests along all streams and shorelines.

• Promote the expansion and connection of contiguous forests through conservation easements, greenways, purchase and other land conservation mechanisms.

WATER QUALITY PROTECTION AND RESTORATION

Improving water quality is the most critical element in the overall protection and restoration of the Chesapeake Bay and its tributaries. In 1987, we committed to achieving a 40 percent reduction in controllable nutrient loads to the Bay. In 1992, we committed to tributary-specific reduction strategies to achieve this reduction and agreed to stay at or below these nutrient loads once attained. We have made measurable reductions in pollution loading despite continuing growth and development. Still, we must do more.

Recent actions taken under the Clean Water Act resulted in listing portions of the Chesapeake Bay and its tidal rivers as “impaired waters.” These actions have emphasized the regulatory framework of the Act along with the ongoing cooperative efforts of the Chesapeake Bay Program as the means to address the nutrient enrichment problems within the Bay and its rivers. In response, we have developed, and are implementing, a process for integrating the cooperative and statutory programs of the Chesapeake Bay and its tributaries. We have agreed to the goal of improving water quality in the Bay and its tributaries so that these waters may be removed from the impaired waters list prior to the time when regulatory mechanisms under Section 303(d) of the Clean Water Act would be applied.

We commit to achieve and maintain water quality conditions necessary to support living resources throughout the Chesapeake Bay ecosystem. Where we have failed to achieve established water quality goals, we will take actions necessary to reach and maintain those goals. We will make pollution prevention a central theme in the protection of water quality. And we will take actions that protect freshwater flow regimes for riverine and estuarine habitats. In pursuing the restoration of vital habitats throughout the watershed, we will continue efforts to improve water clarity in order to meet light requirements necessary to support SAV. We will expand our efforts to reduce sediments and airborne pollution, and ensure that the Bay is free from toxic effects on living resources and human health. We will continue our cooperative intergovernmental approach to achieve and maintain water quality goals through cost-effective and equitable means within the framework of federal and state law. We will evaluate the potential impacts of emerging issues, including, among others, airborne ammonia and nonpoint sources of chemical contaminants. Finally, we will continue to monitor water quality conditions and adjust our strategies accordingly.

GOAL

Achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health.

Nutrients and Sediments

• Continue efforts to achieve and maintain the 40 percent nutrient reduction goal agreed to in 1987, as well as the goals being adopted for the tributaries south of the Potomac River.

• By 2010, correct the nutrient- and sediment-related problems in the Chesapeake Bay and its tidal tributaries sufficiently to remove the Bay and the tidal portions of its tributaries from the list of impaired waters under the Clean Water Act. In order to achieve this:

1. By 2001, define the water quality conditions necessary to protect aquatic living resources and then assign load reductions for nitrogen and phosphorus to each major tributary;

2. Using a process parallel to that established for nutrients, determine the sediment load reductions necessary to achieve the water quality conditions that protect aquatic living resources, and assign load reductions for sediment to each major tributary by 2001;

3. By 2002, complete a public process to develop and begin implementation of revised Tributary Strategies to achieve and maintain the assigned loading goals;

4. By 2003, the jurisdictions with tidal waters will use their best efforts to adopt new or revised water quality standards consistent with the defined water quality conditions. Once adopted by the jurisdictions, the Environmental Protection Agency will work expeditiously to review the new or revised standards, which will then be used as the basis for removing the Bay and its tidal rivers from the list of impaired waters; and

5. By 2003, work with the Susquehanna River Basin Commission and others to adopt and begin implementing strategies that prevent the loss of the sediment retention capabilities of the lower Susquehanna River dams.

Chemical Contaminants

• We commit to fulfilling the 1994 goal of a Chesapeake Bay free of toxics by reducing or eliminating the input of chemical contaminants from all controllable sources to levels that result in no toxic or bioaccumulative impact on the living resources that inhabit the Bay or on human health.

• By Fall of 2000, reevaluate and revise, as necessary, the “Chesapeake Bay Basinwide Toxics Reduction and Prevention Strategy” focusing on:

1. Complementing state and federal regulatory programs to go beyond traditional point source controls, including nonpoint sources such as groundwater discharge and atmospheric deposition, by using a watershed-based approach; and

2. Understanding the effects and impacts of chemical contaminants to increase the effectiveness of management actions.

• Through continual improvement of pollution prevention measures and other voluntary means, strive for zero release of chemical contaminants from point sources, including air sources. Particular emphasis shall be placed on achieving, by 2010, elimination of mixing zones for persistent or bioaccumulative toxics.

• Reduce the potential risk of pesticides to the Bay by targeting education, outreach and implementation of Integrated Pest Management and specific Best Management Practices on those lands that have higher potential for contributing pesticide loads to the Bay.

Priority Urban Waters

• Support the restoration of the Anacostia River, Baltimore Harbor, and Elizabeth River and their watersheds as models for urban river restoration in the Bay basin.

• By 2010, the District of Columbia, working with its watershed partners, will reduce pollution loads to the Anacostia River in order to eliminate public health concerns and achieve the living resource, water quality and habitat goals of this and past Agreements.

Air Pollution

• By 2003, assess the effects of airborne nitrogen compounds and chemical contaminants on the Bay ecosystem and help establish reduction goals for these contaminants.

Boat Discharge

• By 2003, establish appropriate areas within the Chesapeake Bay and its tributaries as “no discharge zones” for human waste from boats. By 2010, expand by 50 percent the number and availability of waste pump-out facilities.

• By 2006, reassess our progress in reducing the impact of boat waste on the Bay and its tributaries. This assessment will include evaluating the benefits of further expanding no discharge zones, as well as increasing the number of pump-out facilities.

SOUND LAND USE

In 1987, the signatories agreed that "there is a clear correlation between population growth and associated development and environmental degradation in the Chesapeake Bay system." This Agreement reaffirms that concept and recognizes that more must be done.

An additional three million people are expected to settle in the watershed by 2020. This growth could potentially eclipse the nutrient reduction and habitat protection gains of the past. Therefore it is critical that we consider our approaches to land use in order to ensure progress in protecting the Bay and its local watersheds.

Enhancing, or even maintaining, the quality of the Bay while accommodating growth will frequently involve difficult choices. It will require a renewed commitment to appropriate development standards. The signatories will assert the full measure of their authority to limit and mitigate the potential adverse effects of continued growth; each however, will pursue this objective within the framework of its own historic, existing or future land use practices or processes. Local jurisdictions have been delegated authority over many decisions regarding growth and development which have both direct and indirect effects on the Chesapeake Bay system and its living resources. The role of local governments in the Bay's restoration and protection effort will be given proper recognition and support through state and federal resources. States will also engage in active partnerships with local governments in managing growth and development in ways that support the following goal.

We acknowledge that future development will be sustainable only if we protect our natural and rural resource land, limit impervious surfaces and concentrate new growth in existing population centers or suitable areas served by appropriate infrastructure. We will work to integrate environmental, community and economic goals by promoting more environmentally sensitive forms of development. We will also strive to coordinate land-use, transportation, water and sewer and other infrastructure planning so that funding and policies at all levels of government do not contribute to poorly planned growth and development or degrade local water quality and habitat. We will advance these policies by creating partnerships with local governments to protect our communities and to discharge our duties as trustees in the stewardship of the Chesapeake Bay. Finally, we will report every two years on our progress in achieving our commitments to promote sound land use.

GOAL

Develop, promote and achieve sound land use practices
which protect and restore watershed resources and water quality,
maintain reduced pollutant loadings for the Bay and its tributaries,
and restore and preserve aquatic living resources.

Land Conservation

• By 2001, complete an assessment of the Bay's resource lands including forests and farms, emphasizing their role in the protection of water quality and critical habitats, as well as cultural and economic viability.

• Provide financial assistance or new revenue sources to expand the use of voluntary and market-based mechanisms such as easements, purchase or transfer of development rights and other approaches to protect and preserve natural resource lands.

• Strengthen programs for land acquisition and preservation within each state that are supported by funding and target the most valued lands for protection. Permanently preserve from development 20 percent of the land area in the watershed by 2010.

• Provide technical and financial assistance to local governments to plan for or revise plans, ordinances and subdivision regulations to provide for the conservation and sustainable use of the forest and agricultural lands.

• In cooperation with local governments, develop and maintain in each jurisdiction a strong GIS system to track the preservation of resource lands and support the implementation of sound land use practices.

Development, Redevelopment and Revitalization

• By 2012, reduce the rate of harmful sprawl development of forest and agricultural land in the Chesapeake Bay watershed by 30 percent measured as an average over five years from the baseline of 1992-1997, with measures and progress reported regularly to the Chesapeake Executive Council.

• By 2005, in cooperation with local government, identify and remove state and local impediments to low impact development designs to encourage the use of such approaches and minimize water quality impacts.

• Work with communities and local governments to encourage sound land use planning and practices that address the impacts of growth, development and transportation on the watershed.

• By 2002, review tax policies to identify elements which discourage sustainable development practices or encourage undesirable growth patterns. Promote the modification of such policies and the creation of tax incentives which promote the conservation of resource lands and encourage investments consistent with sound growth management principles.

• The jurisdictions will promote redevelopment and remove barriers to investment in underutilized urban, suburban and rural communities by working with localities and development interests.

• By 2002, develop analytical tools that will allow local governments and communities to conduct watershed-based assessment of the impacts of growth, development and transportation decisions.

• By 2002, compile information and guidelines to assist local governments and communities to promote ecologically-based designs in order to limit impervious cover in undeveloped and moderately developed watersheds and reduce the impact of impervious cover in highly developed watersheds.

• Provide information to the development community and others so they may champion the application of sound land use practices.

• By 2003, work with local governments and communities to develop land-use management and water resource protection approaches that encourage the concentration of new residential development in areas supported by adequate water resources and infrastructure to minimize impacts on water quality.

• By 2004, the jurisdictions will evaluate local implementation of stormwater, erosion control and other locally-implemented water quality protection programs that affect the Bay system and ensure that these programs are being coordinated and applied effectively in order to minimize the impacts of development.

• Working with local governments and others, develop and promote wastewater treatment options, such as nutrient reducing septic systems, which protect public health and minimize impacts to the Bay's resources.

• Strengthen brownfield redevelopment. By 2010, rehabilitate and restore 1,050 brownfield sites to productive use.

• Working with local governments, encourage the development and implementation of emerging urban storm water retrofit practices to improve their water quantity and quality function.

Transportation

• By 2002, the signatory jurisdictions will promote coordination of transportation and land use planning to encourage compact, mixed use development patterns, revitalization in existing communities and transportation strategies that minimize adverse effects on the Bay and its tributaries.

• By 2002, each state will coordinate its transportation policies and programs to reduce the dependence on automobiles by incorporating travel alternatives such as telework, pedestrian, bicycle and transit options, as appropriate, in the design of projects so as to increase the availability of alternative modes of travel as measured by increased use of those alternatives.

• Consider the provisions of the federal transportation statutes for opportunities to purchase easements to preserve resource lands adjacent to rights of way and special efforts for stormwater management on both new and rehabilitation projects.

• Establish policies and incentives which encourage the use of clean vehicle and other transportation technologies that reduce emissions.

Public Access

• By 2010, expand by 30 percent the system of public access points to the Bay, its tributaries and related resource sites in an environmentally sensitive manner by working with state and federal agencies, local governments and stakeholder organizations.

• By 2005, increase the number of designated water trails in the Chesapeake Bay region by 500 miles.

• Enhance interpretation materials that promote stewardship at natural, recreational, historical and cultural public access points within the Chesapeake Bay watershed.

• By 2003, develop partnerships with at least 30 sites to enhance place-based interpretation of Bay-related resources and themes and stimulate volunteer involvement in resource restoration and conservation.

STEWARDSHIP AND COMMUNITY ENGAGEMENT

The Chesapeake Bay is dependent upon the actions of every citizen in the watershed, both today and in the future. We recognize that the cumulative benefit derived from community-based watershed programs is essential for continued progress toward a healthier Chesapeake Bay. Therefore, we commit ourselves to engage our citizens by promoting a broad conservation ethic throughout the fabric of community life, and foster within all citizens a deeper understanding of their roles as trustees of their own local environments. Through their actions, each individual can contribute to the health and well-being of their neighborhood streams, rivers and the land that surrounds them, not only as ecological stewards of the Bay but also as members of watershed-wide communities. By focusing individuals on local resources, we will advance Baywide restoration as well.

We recognize that the future of the Bay also depends on the actions of generations to follow. Therefore, we commit to provide opportunities for cooperative learning and action so that communities can promote local environmental quality for the benefit and enjoyment of residents and visitors. We will assist communities throughout the watershed in improving quality of life, thereby strengthening local economies and connecting individuals to the Bay through their shared sense of responsibility. We will seek to increase the financial and human resources available to localities to meet the challenges of restoring the Chesapeake Bay.

GOAL

Promote individual stewardship and assist individuals, community-based organizations, businesses, local governments and schools to undertake initiatives to achieve the goals and commitments of this agreement.

Education and Outreach

• Make education and outreach a priority in order to achieve public awareness and personal involvement on behalf of the Bay and local watersheds.

• Provide information to enhance the ability of citizen and community groups to participate in Bay restoration activities on their property and in their local watershed.

• Expand the use of new communications technologies to provide a comprehensive and interactive source of information on the Chesapeake Bay and its watershed for use by public and technical audiences. By 2001, develop and maintain a web-based clearing house of this information specifically for use by educators.

• Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.

• Continue to forge partnerships with the Departments of Education and institutions of higher learning in each jurisdiction to integrate information about the Chesapeake Bay and its watershed into school curricula and university programs.

• Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property.

• By 2002, expand citizen outreach efforts to more specifically include minority populations by, for example, highlighting cultural and historical ties to the Bay, and providing multi-cultural and multi-lingual educational materials on stewardship activities and Bay information.

Community Engagement

• Jurisdictions will work with local governments to identify small watersheds where community-based actions are essential to meeting Bay restoration goals—in particular wetlands, forested buffers, stream corridors and public access and work with local governments and community organizations to bring an appropriate range of Bay program resources to these communities.

• Enhance funding for locally-based programs that pursue restoration and protection projects that will assist in the achievement of the goals of this and past agreements.

• By 2001, develop and maintain a clearing house for information on local watershed restoration efforts, including financial and technical assistance.

• By 2002, each signatory jurisdiction will offer easily-accessible information suitable for analyzing environmental conditions at a small watershed scale.

• Strengthen the Chesapeake Bay Program's ability to incorporate local governments into the policy decision making process. By 2001, complete a reevaluation of the Local Government Participation Action Plan and make necessary changes in Bay program and jurisdictional functions based upon the reevaluation.

• Improve methods of communication with and among local governments on Bay issues and provide adequate opportunities for discussion of key issues.

• By 2001, identify community watershed organizations and partnerships. Assist in establishing new organizations and partnerships where interest exists. These partners will be important to successful watershed management efforts in distributing information to the public, and engaging the public in the Bay restoration and preservation effort.

• By 2005, identify specific actions to address the challenges of communities where historically poor water quality and environmental conditions have contributed to disproportional health, economic or social impacts.

Government by Example

• By 2002, each signatory will put in place processes to:

1. Ensure that all properties owned, managed or leased by the signatories are developed, redeveloped and used in a manner consistent with all relevant goals, commitments and guidance of this Agreement.

2. Ensure that the design and construction of signatory-funded development and redevelopment projects are consistent with all relevant goals, commitments and guidance of this Agreement.

• Expand the use of clean vehicle technologies and fuels on the basis of emission reductions, so that a significantly greater percentage of each signatory government's fleet of vehicles use some form of clean technology.

• By 2001, develop an Executive Council Directive to address stormwater management to control nutrient, sediment and chemical contaminant runoff from state, federal and District owned land.

Partnerships

• Strengthen partnerships with Delaware, New York and West Virginia by promoting communication and by seeking agreements on issues of mutual concern.

• Work with non-signatory Bay states to establish links with community-based organizations throughout the Bay watershed.

THIS AGREEMENT, we rededicate ourselves to the restoration and protection of the ecological integrity, productivity and beneficial uses of the Chesapeake Bay system. We reaffirm our commitment to previously-adopted Chesapeake Bay Agreements and their supporting policies. We agree to report annually to the citizens on the state of the Bay and consider any additional actions necessary.

____

(Date)

FOR THE CHESAPEAKE BAY COMMISSION

____

FOR THE STATE OF MARYLAND ________________________________

FOR THE COMMONWEALTH OF PENNSYLVANIA

____

FOR THE COMMONWEALTH OF VIRGINIA ________________________________

FOR THE DISTRICT OF COLUMBIA ________________________________

FOR THE UNITED STATES OF AMERICA ________________________________

APPENDIX C

Point Source Facility Nutrient Loading Tables by Tributary Basin

Table C-1. Shenandoah/Potomac River Basin 1999 Point Source Phosphorus Discharge Inventory

RANK	LOCATION	FACILITY	1999 TP LOAD DISCH. (LBS/YR)	1985 TP LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Waynesboro	DuPont-Waynesboro	1,120	57,200	-98%
2	Page	Luray STP	1,710	14,420	-88%
3	Arlington	Arlington STP	7,530	46,890	-84%
4	Warren	Front Royal STP	7,740	38,380	-80%
5	Prince William	Quantico-Mainside STP	220	880	-75%
6	Alexandria	Alexandria STP	4,240	16,260	-74%
7	Staunton	Staunton-Middle River STP[1]	16,440	50,260	-67%
8	Shenandoah	Strasburg STP	4,970	14,420	-66%
9	Shenandoah	Woodstock STP	3,260	9,160	-64%
10	Augusta	ACSA-Fishersville STP	5,460	15,200	-64%
11	Stafford	Aquia STP	810	2,050	-60%
12	Rockingham	Broadway STP	2,040	4,810	-58%
13	Loudoun	Leesburg	10,850	25,570	-58%
14	Waynesboro	Waynesboro STP	22,360	48,320	-54%
15	Loudoun	Purcellville	2,480	5,260	-53%
16	Rockingham	HRRSA-North River STP	60,100	125,660	-52%
17	Augusta	ACSA-Stuarts Draft STP	5,560	9,740	-43%
18	Prince William	PWCSA-Mooney STP	2,170	3,690	-41%
19	King George	King George-Dahlgren STP[2]	1,040	1,560	-33%
20	Prince William	Dale Serv. Corp. #1	800	1,100	-27%
21	Westmoreland	Colonial Beach STP	6,040	7,790	-22%
22	Fairfax	Noman Cole STP[3]	11,370	14,050	-19%
23	Rockingham	Timberville STP	1,460	1,750	-17%
24	Prince William	Dale Serv. Corp. #8	750	840	-11%
25	Rockingham	Rocco Quality Foods	14,610	14,610	0%
26	Rockingham	Merck-Elkton	81,140	60,580	34%
27	Shenandoah	Rocco Farm Foods	36,970	19,090	94%
28	DC	Blue Plains - VA Portion	15,840	6,850	131%
29	Rockingham	Wampler-Broadway	950	280	239%
30	Fairfax	Upper Occoquan S.A.	2,920	860	240%
31	Frederick	FWSA-Opequon STP[4]	34,100	NA	NA
32	Rockingham	Massanutten PSA STP[4]	3,220	NA	NA
33	King George	USNSWC-Dahlgren STP[4]	4,240	NA	NA
34	Frederick	Parkins Mill STP[4]	8,940	NA	NA
		Basin Total =	**383,450**	**678,480**[5]	**-43%**

NOTES: [1] Accounts for Verona and Middle River plants in 1985 comparison.
[2] Accounts for Dahlgren and Bayberry plants in 1985 comparison.
[3] Accounts for Lower Potomac and Little Hunting Creek plants in 1985 comparison.
[4] These facilities are either new or loads from 1985 are not available for comparison.
[5] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.

Table C-2. Shenandoah/Potomac River Basin 1999 Point Source Nitrogen Discharge Inventory

RANK	LOCATION	FACILITY	1999 TN LOAD DISCH. (LBS/YR)	1985 TN LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Waynesboro	DuPont-Waynesboro	38,380	299,630	-87%
2	Page	Luray STP	6,270	42,120	-85%
3	Augusta	ACSA-Fishersville STP	20,080	44,400	-55%
4	Rockingham	Merck-Elkton	108,260	233,880	-54%
5	Staunton	Staunton-Middle River STP[1]	69,030	146,870	-53%
6	Arlington	Arlington STP	918,570	1,641,280	-44%
7	Prince William	Quantico-Mainside STP	52,880	82,540	-36%
8	Warren	Front Royal STP	77,730	112,140	-31%
9	Stafford	Aquia STP	54,100	64,890	-17%
10	Waynesboro	Waynesboro STP	167,220	190,930	-12%
11	Shenandoah	Strasburg STP	37,170	42,120	-12%
12	Prince William	PWCSA-Mooney STP	540,670	609,160	-11%
13	Shenandoah	Woodstock STP	24,400	26,760	-9%
14	Prince William	Dale Serv. Corp. #1	89,620	91,320	-2%
15	King George	King George-Dahlgren STP[2]	4,800	4,550	5%
16	Fairfax	Noman Cole STP[3]	2,210,180	1,906,340	16%
17	Rockingham	HRRSA-North River STP	437,060	367,160	19%
18	Loudoun	Purcellville	18,540	15,370	21%
19	Augusta	ACSA-Stuarts Draft STP	36,120	28,460	27%
20	Alexandria	Alexandria STP	2,796,130	1,994,000	40%
21	Rockingham	Broadway STP	21,060	14,250	48%
22	Westmoreland	Colonial Beach STP	35,070	22,770	54%
23	DC	Blue Plains - VA Portion	1,262,350	814,170	55%
24	Shenandoah	Rocco Farm Foods	285,350	147,310	94%
25	Rockingham	Rocco Quality Foods	26,170	12,490	110%
26	Loudoun	Leesburg	162,840	71,730	127%
27	Fairfax	Upper Occoquan S.A.	1,369,760	597,530	129%
28	Prince William	Dale Serv. Corp. #8	96,150	38,360	151%
29	Rockingham	Timberville STP	14,770	5,130	188%
30	Rockingham	Wampler-Broadway	127,140	40,500	214%
31	Frederick	FWSA-Opequon STP[4]	274,660	NA	NA
32	Rockingham	Massanutten PSA STP[4]	24,090	NA	NA
33	King George	USNSWC-Dahlgren STP[4]	17,990	NA	NA
34	Frederick	Parkins Mill STP[4]	66,880	NA	NA
		Basin Total =	**11,491,490**	**10,663,440**[5]	**+8%**

NOTES: [1] Accounts for Verona and Middle River plants in 1985 comparison.

[2] Accounts for Dahlgren and Bayberry plants in 1985 comparison.

[3] Accounts for Lower Potomac and Little Hunting Creek plants in 1985 comparison.

[4] These facilities are either new or loads from 1985 are not available for comparison.

[5] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.

Table C-3. Rappahannock River Basin 1999 Point Source Phosphorus Discharge Inventory

RANK	LOCATION	FACILITY	1999 TP LOAD DISCH. (LBS/YR)	1985 TP LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Spotsylvania	Massaponax STP	4,350	29,580	-85%
2	Fredericksburg	Fredericksburg STP	10,530	50,070	-79%
3	Culpeper	Culpeper STP	9,470	32,450	-71%
4	Middlesex	Urbanna STP	350	970	-64%
5	Fauquier	Warrenton STP	7,510	20,460	-63%
6	Orange	Orange STP	4,450	11,880	-63%
7	Essex	Tappahannock STP	2,610	4,290	-39%
8	Richmond	Warsaw STP	1,300	1,560	-17%
9	Fauquier	Remington STP	3,360	3,510	-4%
10	Spotsylvania	FMC STP[1]	3,260	NA	NA
11	Stafford	Little Falls Run STP[1]	7,110	NA	NA
12	Caroline	Ft. A.P. Hill - Wilcox STP[1]	860	NA	NA
13	Orange	Wilderness STP[1]	3,800	NA	NA
		Basin Total =	**58,960**	**184,190**[2]	**-68%**

Table C-4. Rappahannock River Basin 1999 Point Source Nitrogen Discharge Inventory

RANK	LOCATION	FACILITY	1999 TN LOAD DISCH. (LBS/YR)	1985 TN LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Fredericksburg	Fredericksburg STP	41,080	146,300	-72%
2	Fauquier	Remington STP	7,720	10,250	-25%
3	Middlesex	Urbanna STP	2,620	2,850	-8%
4	Fauquier	Warrenton STP	56,150	59,770	-6%
5	Orange	Orange STP	33,270	34,720	-4%
6	Culpeper	Culpeper STP	53,630	52,560	2%
7	Essex	Tappahannock STP	19,540	12,520	56%
8	Richmond	Warsaw STP	9,720	4,550	114%
9	Spotsylvania	Massaponax STP	196,590	88,230	123%
10	Spotsylvania	FMC STP[1]	48,540	NA	NA
11	Stafford	Little Falls Run STP[1]	57,260	NA	NA
12	Caroline	Ft. A.P. Hill - Wilcox STP[1]	6,450	NA	NA
13	Orange	Wilderness STP[1]	28,450	NA	NA
		Basin Total =	**561,020**	**487,890**[2]	**+15%**

NOTES: [1] FMC, Little Falls Run, Ft. A.P. Hill, and Wilderness STPs are either new facilties or loads for 1985 are not available for comparison.
[2] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.

Table C-5. York River Basin 1999 Point Source Phosphorus Discharge Inventory

RANK	LOCATION	FACILITY	1999 TP LOAD DISCH. (LBS/YR)	1985 TP LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	King William	West Point STP	2,130	9,740	-78%
2	York	HRSD-York STP	42,990	152,130	-72%
3	Orange	Gordonsville STP	4,600	10,720	-57%
4	King William	St. Laurent Paper	111,810	241,530	-54%
5	Hanover	Ashland STP	7,490	12,300	-39%
6	Hanover	Doswell STP	23,140	19,730	17%
7	York	Amoco-Yorktown[1]	18,360	2,220	NA
8	Caroline	Caroline Co. STP[2]	6,790	NA	NA
		Basin Total =	**217,310**	**448,370**	**-52%**

Table C-6. York River Basin 1999 Point Source Nitrogen Discharge Inventory

RANK	LOCATION	FACILITY	1999 TN LOAD DISCH. (LBS/YR)	1985 TN LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	King William	West Point STP	30,880	28,460	9%
2	Orange	Gordonsville STP	34,400	31,310	10%
3	York	HRSD-York STP	570,100	481,920	18%
4	King William	St. Laurent Paper	800,110	586,340	36%
5	Hanover	Ashland STP	56,060	35,050	60%
6	Hanover	Doswell STP	111,700	65,550	70%
7	York	Amoco-Yorktown[1]	114,340	157,760	NA
8	Caroline	Caroline Co. STP[2]	10,850	NA	NA
		Basin Total =	**1,728,440**	**1,386,390**	**+25%**

NOTES: [1] Due to changes in sampling location requirements in the Amoco-Yorktown reissued discharge permit, it is inappropriate to compare 1999 loads with 1985.
[2] Caroline Co. STP is a new facility with no 1985 loads to compare against.

Table C-7. James River Basin 1999 Point Source Phosphorus Discharge Inventory

RANK	LOCATION	FACILITY	1999 TP LOAD DISCH. (LBS/YR)	1985 TP LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Newport News	Fort Eustis STP	3,090	32,150	-90%
2	Chesterfield	Falling Creek STP	21,390	209,280	-90%
3	Richmond	Richmond STP	89,120	839,070	-89%
4	Petersburg	So. Central W.W.A. STP	18,880	144,560	-87%
5	Chesterfield	Philip Morris	7,920	60,580	-87%
6	Newport News	HRSD-Boat Harbor STP	57,900	260,550	-78%
7	Hopewell	Hopewell STP	38,990	175,440	-78%
8	Newport News	HRSD-James River STP	53,990	226,630	-76%
9	Chesterfield	Brown & Williamson	3,380	13,600	-75%
10	Norfolk	HRSD-Army Base STP	51,860	177,940	-71%
11	Alleghany	Covington STP	13,990	37,410	-63%
12	Chesterfield	DuPont-Spruance	8,430	22,230	-62%
13	James City	HRSD-Williamsburg STP	43,350	112,440	-61%
14	Rockbridge	Lexington STP	6,660	16,950	-61%
15	Clifton Forge	Clifton Forge STP	9,370	22,210	-58%
16	Buena Vista	Buena Vista STP	15,520	36,630	-58%
17	Portsmouth	Clariant Corp.	260	530	-51%
18	Norfolk	HRSD-VIP STP	101,010	200,610	-50%
19	Chesterfield	Proctors Creek STP	32,160	63,120	-49%
20	Lynchburg	Lynchburg STP	121,990	196,310	-38%
21	Suffolk	HRSD-Nansemond STP	83,570	133,180	-37%
22	Albemarle	RWSA-Moores Creek STP	73,570	90,860	-19%
23	Prince Edward	Farmville STP	7,050	6,000	18%
24	Alleghany	Westvaco	27,930	20,110	39%
25	Hopewell	AlliedSignal-Hopewell	50,560	29,320	72%
26	Rockbridge	Lees Commercial Carpet	66,420	37,870	75%
27	Hanover	Tyson Foods-Glen Allen	480	140	243%
28	Campbell	BWX-Tech NNFD	1,610	410	293%
29	Bedford	Georgia-Pacific	159,720	32,120	397%
30	Henrico	Henrico STP[1]	153,050	NA	NA
		Basin Total =	**1,323,220**	**3,605,100**[2]	**-63%**

NOTES: [1] Henrico STP is a new facility; it's 1985 load is accounted for in the Richmond figure.

[2] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.

Table C-8. James River Basin 1999 Point Source Nitrogen Discharge Inventory

RANK	LOCATION	FACILITY	1999 TN LOAD DISCH. (LBS/YR)	1985 TN LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Portsmouth	Clariant Corp.	8,400	99,050	-92%
2	Hopewell	AlliedSignal-Hopewell	996,550	4,460,620	-78%
3	Hopewell	Hopewell STP	1,399,760	6,101,060	-77%
4	Hanover	Tyson Foods-Glen Allen	32,760	132,470	-75%
5	Campbell	BWX-Tech NNFD	215,540	728,250	-70%
6	Chesterfield	Falling Creek STP	244,360	767,860	-68%
7	James City	HRSD-Williamsburg STP	275,420	632,010	-56%
8	Chesterfield	Brown & Williamson	23,850	49,350	-52%
9	Petersburg	So. Central W.W.A. STP	278,510	513,180	-46%
10	Norfolk	HRSD-VIP STP	802,590	1,336,790	-40%
11	Richmond	Richmond STP	1,524,050	2,462,870	-38%
12	Newport News	Fort Eustis STP	58,530	93,930	-38%
13	Lynchburg	Lynchburg STP	336,680	460,840	-27%
14	Newport News	HRSD-Boat Harbor STP	923,870	1,077,400	-14%
15	Buena Vista	Buena Vista STP	93,660	107,020	-12%
16	Alleghany	Covington STP	104,620	109,300	-4%
17	Chesterfield	DuPont-Spruance	177,230	183,890	-4%
18	Rockbridge	Lexington STP	49,850	49,520	1%
19	Norfolk	HRSD-Army Base STP	806,490	773,450	4%
20	Clifton Forge	Clifton Forge STP	70,070	64,890	8%
21	Suffolk	HRSD-Nansemond STP	638,030	509,130	25%
22	Newport News	HRSD-James River STP	843,100	631,100	34%
23	Albemarle	RWSA-Moores Creek STP	414,720	308,690	34%
24	Chesterfield	Philip Morris	206,520	152,500	35%
25	Chesterfield	Proctors Creek STP	240,320	176,620	36%
26	Alleghany	Westvaco	770,390	554,760	39%
27	Rockbridge	Lees Commercial Carpet	56,660	24,380	132%
28	Prince Edward	Farmville STP	52,720	18,000	193%
29	Bedford	Georgia-Pacific	280,590	54,960	411%
30	Henrico	Henrico STP[1]	1,426,070	NA	NA
		Basin Total =	**13,351,910**	**23,981,000[2]**	**-44%**

NOTES: [1] Henrico STP is a new facility; it's 1985 load is accounted for in the Richmond figure.
[2] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.

Table C-9. Coastal Basin 1999 Point Source Phosphorus Discharge Inventory

RANK	LOCATION	FACILITY	1999 TP LOAD DISCH. (LBS/YR)	1985 TP LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Virginia Beach	HRSD-Ches/Eliz STP	105,570	284,140	-63%
2	Accomack	Tangier STP	450	1,170	-62%
3	Northumberland	Reedville STP	280	580	-52%
4	Mathews	Mathews Courthouse STP	280	580	-52%
5	Accomack	Onancock STP	1,850	2,140	-14%
6	Lancaster	Kilmarnock STP	2,920	3,310	-12%
7	Accomack	Tyson-Temperanceville	45,500	36,530	25%
8	Northampton	Cape Charles STP[1]	1,080	NA	NA
		Basin Total =	**157,930**	**330,800[2]**	**-52%**

Table C-10. Coastal Basin 1999 Point Source Nitrogen Discharge Inventory

RANK	LOCATION	FACILITY	1999 TN LOAD DISCH. (LBS/YR)	1985 TN LOAD DISCH. (LBS/YR)	% CHANGE FROM 1985
1	Lancaster	Kilmarnock STP	2,430	9,680	-75%
2	Accomack	Tangier STP	3,400	3,420	-1%
3	Accomack	Tyson-Temperanceville	331,760	277,400	20%
4	Northumberland	Reedville STP	2,120	1,710	24%
5	Virginia Beach	HRSD-Ches/Eliz STP	1,346,220	995,790	35%
6	Mathews	Mathews Courthouse STP	2,680	1,710	57%
7	Accomack	Onancock STP	13,810	6,260	121%
8	Northampton	Cape Charles STP[1]	8,110	NA	NA
		Basin Total =	**1,710,530**	**1,302,790[2]**	**+31%**

NOTES: [1] Cape Charles STP was not in service in 1985, therefore no loads are available for comparison.
[2] The 1985 Basin Total includes loads from treatment plants that have since gone off-line.